

SynerWeld 2100

Process Controller

Instruction Manual



Read and understand this entire manual and your employer's safety practices before installing, operating, or servicing the equipment.



While the information contained in this manual represents our best judgement, manufacture assumes no liability for its use.

SynerWeld 2100 Process Controller
Instruction Manual No. 0-2644

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Record Serial Numbers For Warranty Purposes

Purchase Date

Power Supply

Torch

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SECTION 1:

GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

NOTE

An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION

A procedure which, if not properly followed, may cause damage to the equipment.



WARNING

A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.02 Important Safety Precautions



WARNING

OPERATION AND MAINTENANCE OF PLASMA ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.



GASES AND FUMES

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.

- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Arsenic	Cobalt	Nickel
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	Vanadium

- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.



ELECTRIC SHOCK

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.



FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. **DO NOT** cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.



NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.



PLASMA ARC RAYS

Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.

- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as recommended in Subsection 1.03, item 4.

1.03 Publications

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202

12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.04 Note, Attention et Avertissement

Dans ce manuel, les mots “note,” “attention,” et “avertissement” sont utilisés pour mettre en relief des informations à caractère important. Ces mises en relief sont classifiées comme suit :

NOTE

Toute opération, procédure ou renseignement général sur lequel il importe d'insister davantage ou qui contribue à l'efficacité de fonctionnement du système.

ATTENTION

Toute procédure pouvant résulter l'endommagement du matériel en cas de non-respect de la procédure en question.



AVERTISSEMENT

Toute procédure pouvant provoquer des blessures de l'opérateur ou des autres personnes se trouvant dans la zone de travail en cas de non-respect de la procédure en question.

1.05 Precautions De Securite Importantes



AVERTISSEMENT

L'OPÉRATION ET LA MAINTENANCE DU MATÉRIEL DE SOUDAGE À L'ARC AU JET DE PLASMA PEUVENT PRÉSENTER DES RISQUES ET DES DANGERS DE SANTÉ.

Il faut communiquer aux opérateurs et au personnel TOUS les dangers possibles. Afin d'éviter les blessures possibles, lisez, comprenez et suivez tous les avertissements, toutes les précautions de sécurité et toutes les consignes avant d'utiliser le matériel. Composez le + 603-298-5711 ou votre distributeur local si vous avez des questions.



FUMÉE et GAZ

La fumée et les gaz produits par le procédé de jet de plasma peuvent présenter des risques et des dangers de santé.

- Eloignez toute fumée et gaz de votre zone de respiration. Gardez votre tête hors de la plume de fumée provenant du chalumeau.
- Utilisez un appareil respiratoire à alimentation en air si l'aération fournie ne permet pas d'éliminer la fumée et les gaz.
- Les sortes de gaz et de fumée provenant de l'arc de plasma dépendent du genre de métal utilisé, des revêtements se trouvant sur le métal et des différents procédés. Vous devez prendre soin lorsque vous coupez ou soudez tout métal pouvant contenir un ou plusieurs des éléments suivants:

antimoine	cadmium	mercure
argent	chrome	nickel
arsenic	cobalt	plomb
baryum	cuivre	sélénium
béryllium	manganèse	vanadium

- Lisez toujours les fiches de données sur la sécurité des matières (sigle américain “MSDS”); celles-ci devraient être fournies avec le matériel que vous utilisez. Les MSDS contiennent des renseignements quant à la quantité et la nature de la fumée et des gaz pouvant poser des dangers de santé.
- Pour des informations sur la manière de tester la fumée et les gaz de votre lieu de travail, consultez l'article 1 et les documents cités à la page 5.

- Utilisez un équipement spécial tel que des tables de coupe à débit d'eau ou à courant descendant pour capter la fumée et les gaz.
- N'utilisez pas le chalumeau au jet de plasma dans une zone où se trouvent des matières ou des gaz combustibles ou explosifs.
- Le phosgène, un gaz toxique, est généré par la fumée provenant des solvants et des produits de nettoyage chlorés. Éliminez toute source de telle fumée.



CHOC ELECTRIQUE

Les chocs électriques peuvent blesser ou même tuer. Le procédé au jet de plasma requiert et produit de l'énergie électrique haute tension. Cette énergie électrique peut produire des chocs graves, voire mortels, pour l'opérateur et les autres personnes sur le lieu de travail.

- Ne touchez jamais une pièce "sous tension" ou "vive"; portez des gants et des vêtements secs. Isolez-vous de la pièce de travail ou des autres parties du circuit de soudage.
- Réparez ou remplacez toute pièce usée ou endommagée.
- Prenez des soins particuliers lorsque la zone de travail est humide ou moite.
- Montez et maintenez le matériel conformément au Code électrique national des Etats-Unis. (Voir la page 5, article 9.)
- Débranchez l'alimentation électrique avant tout travail d'entretien ou de réparation.
- Lisez et respectez toutes les consignes du Manuel de consignes.



INCENDIE ET EXPLOSION

Les incendies et les explosions peuvent résulter des scories chaudes, des étincelles ou de l'arc de plasma. Le procédé à l'arc de plasma produit du métal, des étincelles, des scories chaudes pouvant mettre le feu aux matières combustibles ou provoquer l'explosion de fumées inflammables.

- Soyez certain qu'aucune matière combustible ou inflammable ne se trouve sur le lieu de travail. Protégez toute telle matière qu'il est impossible de retirer de la zone de travail.
- Procurez une bonne aération de toutes les fumées inflammables ou explosives.
- Ne coupez pas et ne soudez pas les conteneurs ayant pu renfermer des matières combustibles.

- Prévoyez une veille d'incendie lors de tout travail dans une zone présentant des dangers d'incendie.
- Le gas hydrogène peut se former ou s'accumuler sous les pièces de travail en aluminium lorsqu'elles sont coupées sous l'eau ou sur une table d'eau. NE PAS couper les alliages en aluminium sous l'eau ou sur une table d'eau à moins que le gas hydrogène peut s'échapper ou se dissiper. Le gas hydrogène accumulé explosera si enflammé.



RAYONS D'ARC DE PLASMA

Les rayons provenant de l'arc de plasma peuvent blesser vos yeux et brûler votre peau. Le procédé à l'arc de plasma produit une lumière infra-rouge et des rayons ultra-violets très forts. Ces rayons d'arc nuiront à vos yeux et brûleront votre peau si vous ne vous protégez pas correctement.

- Pour protéger vos yeux, portez toujours un casque ou un écran de soudeur. Portez toujours des lunettes de sécurité munies de parois latérales ou des lunettes de protection ou une autre sorte de protection oculaire.
- Portez des gants de soudeur et un vêtement protecteur approprié pour protéger votre peau contre les étincelles et les rayons de l'arc.
- Maintenez votre casque et vos lunettes de protection en bon état. Remplacez toute lentille sale ou comportant fissure ou rognure.
- Protégez les autres personnes se trouvant sur la zone de travail contre les rayons de l'arc en fournissant des cabines ou des écrans de protection.
- Respectez le teint de lentille recommandé dans le article 4, page 5.



BRUIT

Le bruit peut provoquer une perte permanente de l'ouïe. Les procédés de soudage à l'arc de plasma peuvent provoquer des niveaux sonores supérieurs aux limites normalement acceptables. Vous devez vous protéger les oreilles contre les bruits forts afin d'éviter une perte permanente de l'ouïe.

- Pour protéger votre ouïe contre les bruits forts, portez des tampons protecteurs et/ou des protections auriculaires. Protégez également les autres personnes se trouvant sur le lieu de travail.
- Il faut mesurer les niveaux sonores afin d'assurer que les décibels (le bruit) ne dépassent pas les niveaux sûrs.

- Pour des renseignements sur la manière de tester le bruit, consultez l'article 1, page 5.

1.06 Documents De Reference

Consultez les normes suivantes ou les révisions les plus récentes ayant été faites à celles-ci pour de plus amples renseignements :

1. OSHA, NORMES DE SÉCURITÉ DU TRAVAIL ET DE PROTECTION DE LA SANTÉ, 29CFR 1910, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. Norme ANSI Z49.1, LA SÉCURITÉ DES OPÉRATIONS DE COUPE ET DE SOUDAGE, disponible auprès de la Société Américaine de Soudage (American Welding Society), 550 N.W. LeJeune Rd., Miami, FL 33126
3. NIOSH, LA SÉCURITÉ ET LA SANTÉ LORS DES OPÉRATIONS DE COUPE ET DE SOUDAGE À L'ARC ET AU GAZ, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. Norme ANSI Z87.1, PRATIQUES SURES POUR LA PROTECTION DES YEUX ET DU VISAGE AU TRAVAIL ET DANS LES ECOLES, disponible de l'Institut Américain des Normes Nationales (American National Standards Institute), 1430 Broadway, New York, NY 10018
5. Norme ANSI Z41.1, NORMES POUR LES CHAUSSURES PROTECTRICES, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
6. Norme ANSI Z49.2, PRÉVENTION DES INCENDIES LORS DE L'EMPLOI DE PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
7. Norme A6.0 de l'Association Américaine du Soudage (AWS), LE SOUDAGE ET LA COUPE DE CONTENEURS AYANT RENFERMÉ DES PRODUITS COMBUSTIBLES, disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
8. Norme 51 de l'Association Américaine pour la Protection contre les Incendies (NFPA), LES SYSTEMES À GAZ AVEC ALIMENTATION EN OXYGENE POUR LE SOUDAGE, LA COUPE ET LES PROCÉDÉS ASSOCIÉS, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. Norme 70 de la NFPA, CODE ELECTRIQUE NATIONAL, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. Norme 51B de la NFPA, LES PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. Brochure GCA P-1, LA MANIPULATION SANS RISQUE DES GAZ COMPRIMÉS EN CYLINDRES, disponible auprès de l'Association des Gaz Comprimés (Compressed Gas Association), 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. Norme CSA W117.2, CODE DE SÉCURITÉ POUR LE SOUDAGE ET LA COUPE, disponible auprès de l'Association des Normes Canadiennes, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada, M9W 1R3
13. ivret NWSA, BIBLIOGRAPHIE SUR LA SÉCURITÉ DU SOUDAGE, disponible auprès de l'Association Nationale de Fournitures de Soudage (National Welding Supply Association), 1900 Arch Street, Philadelphia, PA 19103
14. Norme AWSF4.1 de l'Association Américaine de Soudage, RECOMMANDATIONS DE PRATIQUES SURES POUR LA PRÉPARATION À LA COUPE ET AU SOUDAGE DE CONTENEURS ET TUYAUX AYANT RENFERMÉ DES PRODUITS DANGEREUX , disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
15. Norme ANSI Z88.2, PRATIQUES DE PROTECTION RESPIRATOIRE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018

1.07 Declaration of Conformity

Manufacturer: Thermal Arc
An unincorporated division of Thermal Dynamics Corp
A Thermadyne Company
Address: Industrial Park #2
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEU) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements among them are:

- * CSA (Canadian Standards Association) standard C22.2 number 60-M1990 for Arc welding equipment.
- * UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- * ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) applicable to welding equipment and associated accessories.
- * Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermal Arc has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative: David Ashworth
Vice President & Managing Director
Thermadyne Europe
Chorley England.

1.08 Statement of Warranty

LIMITED WARRANTY: Thermal Arc, an unincorporated division of Thermal Dynamics Corp., A Thermadyne Company, warrants that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Thermal Arc products as stated below, Thermal Arc shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal Arc's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal Arc's sole option, of any components or parts of the product determined by Thermal Arc to be defective.

THERMAL ARC MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHERS, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Thermal Arc shall not under any circumstances be liable for special or consequential damages, such as, but not limited to, damage or loss of purchased or replacement goods, or claims of customers of distributor (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal Arc with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal Arc whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based. No employee, agent, or representative of Thermal Arc is authorized to change this warranty in any way or grant any other warranty.

THIS WARRANTY BECOMES INVALID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH IN THERMAL ARC'S SOLE JUDGMENT MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL ARC PRODUCT.

THIS WARRANTY IS INVALID IF THE PRODUCT IS SOLD BY NON-AUTHORIZED PERSONS.

Except with regards to the products listed below, this warranty shall remain effective three (3) years from the date Thermal Arc's authorized distributor delivers the product to Purchaser, but in no event more than (4) years from the date Thermal Arc delivers the product to the authorized distributor.

Shorter warranty periods apply to the products listed below. On these products, the warranty is effective for the time stated below beginning on the date that the authorized distributor delivers the products to the Purchaser. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date Thermal Arc delivered the product to the authorized distributor.

PLASMA WELDING/			
POWER SUPPLIES	VIKING/GENERATORS	INVERTERS	LABOR
MAIN POWER MAGNETICS (STATIC & ROTATING)	3 YEARS	2 YEARS	1 YEAR
ORIGINAL MAIN POWER RECTIFIER	3 YEARS	2 YEARS	1 YEAR
CONTROL PC BOARD	3 YEARS	2 YEARS	1 YEAR
ALL OTHER CIRCUITS AND COMPONENTS INCLUDING	1 YEAR	1 YEAR	1 YEAR
BUT NOT LIMITED TO, CONTACTORS, RELAYS,			
SOLENOIDS, PUMPS, POWER SWITCHING SEMI-CONDUCTORS			

ENGINES: ENGINES ARE NOT WARRANTED BY THERMAL ARC, ALTHOUGH MOST ARE WARRANTED BY THE ENGINE MANUFACTURER. SEE THE ENGINE MANUFACTURERS WARRANTY FOR DETAILS.

CONSOLES, CONTROL EQUIPMENT, HEAT EXCHANGES, AND ACCESSORY EQUIPMENT	1 YEAR	1 YEAR	1 YEAR
TORCH AND LEADS	180 DAYS	180 DAYS	180 DAYS
REPAIR/REPLACEMENT PARTS	90 DAYS	90 DAYS	90 DAYS

Warranty repairs or replacement claims under this limited warranty must be submitted to Thermal Arc by an authorized Thermal Arc® repair facility within thirty (30) days of the repair. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the customer. All returned goods shall be at the customer's risk and expense. This warranty supersedes all previous Thermal Arc warranties.

Thermal Arc® is a Registered Trademark of Thermadyne.

Effective May 1, 1997

SECTION 2: INTRODUCTION

2.01 The SynerWeld Welding Process

Combining the self-contained **SynerWeld 2100 Processor Controller** and **MPC-21 ICW Cold Wire Feeder** with the **Ultima-150** Plasma Welding Process will provide a small but very powerful integrated Plasma Welding/Brazing Process. Utilizing specifically designed Plasma Welding torches with integrated cold feed wire capabilities for manual or automated use, provides the market with a very unique product that meets today's high standards of welding process repeatability.

This product is based on utilizing the Plasma Arc process for producing high integrity welded joints requiring filler-metal addition. High quality welds and high deposition rates are achieved by integration of the wire feed process with specially designed torches, while the **Thermal Arc SynerWeld 2100** Microprocessor Controller ensures consistent and repeatable control of weld current and wire feed rates.

This process performs very well in applications that have historically been performed with Mig, Tig, and Oxy-fuel to deposit materials such as Silicon Bronze, mild steels, stainless steels, nickel alloys, titanium, and others. In many cases, costly secondary operations such as grinding, spatter, distortion, etc., are typical characteristics of these processes. Grinding operations are costly and not very environmental compliant. Brazing/Welding with a Plasma Arc allows for no spatter, less material applied, controlled heat input, minimal porosity, and improved aesthetics. The process is most capable of welding or brazing a wide range of material thicknesses.

2.02 General Description

A. SynerWeld 2100 Process Controller

The **SynerWeld 2100** Process Controller is a micro-processor based unit designed to provide accurate and repeatable control over the complete welding process.

The unit is designed to store 10 separate welding programs and a unique programmable calibration schedule in its 8 year battery backed memory. Each program contains a program number to help you select the correct program for a particular part.

The programs can hold information for two channels. This information includes the desired output level and timing sequencing for each channel. For the PAW processes, the channels are usually welding current control, and wire feed speed.

Each program can also have some control of the torch movement and placement before and after the weld.

The **SynerWeld 2100** also has the capability of manual control. Manual control can be used to help set up welding parameters or to jog a certain motion, such as the wire, the travel device or the torch.

Each program allows complete control over two welding parameters of the process as well as some on/off control over other parameters.

When the Process is connected to hardware which allows closed-loop feedback to be used, each of the two parameters is closely monitored (50 times per second) automatically to maintain the set value which has been programmed. The closed-loop feedback guarantees an accuracy of 1% of the set value under normal operating procedures (dependent upon the connected hardware).

Once the SynerWeld 2100 is programmed and calibrated, the battery-backed memory insures the configuration data will be there the next time you turn on the unit.

The control comes equipped with Start, Stop and Emergency Stop buttons for operator control. The unit has a 20 entry keypad and an 80 character LCD backlight display.

Inside, the unit has a micro-processor board and a 5 VDC power supply. The function of these items are described below:

1. Micro-Processor Board

The Micro-Processor Board is mounted on the rear of the enclosure door. The board is the brain of the control. It handles all of the sequencing and timing functions involved in programs. It controls the level of analog output, monitors the analog feedback level, and compensates accordingly.

2. Channel Board

The SynerWeld 2100 Control is equipped with two Channel Boards. These boards generate the isolated analog output control voltage, condition and isolate the incoming feedback signal, isolate the digital input signals, and house the output relays. They condition the signals, both analog and digital, between the processor and the actual channel being controlled.

3. Power Supply

The SynerWeld 2100 Process Controller is designed to operate on a single + 5 VDC power supply. This power supply is capable of delivering all the power necessary to operate all three boards and the display, yet operate at an efficient temperature. The power supply also has the capability of sensing the input voltage and automatically adjusting for it.

2.03 Specifications & Design Features

A. SynerWeld 2100™ Add-On Weld Process Controller

The SynerWeld 2100™ Weld Process Controller is a micro-processor based unit designed to provide accurate and repeatable control over the complete welding process.



Figure 2-1 Synerweld 2100 Process Controller

1. Standard Features:

- 10 Program Memory (battery backup)
- 2 Channel Control with Adjustable Weld Parameters
- Controlled Weld Pulse Rate up to 1000 Pulses/Second
- Large 20 key Membrane-Style Keypad
- Large LCD Backlight 4x20 character display

2. Specifications:

- Processor: AMD AM188, Intel 80C196KC, 16 Mhz.
- Keypad: 20 key, membrane style
- Memory: 10 program (battery backedup)
- Channels 2 (Current & Wire)
- Display: 4 x 20 Character LCD Backlight
- Power Requirements: 115/230 VAC, 50/60 Hz
- Cord Length: 6 ft. (1.8m)
- Dimensions: 12" (305mm) high x 15" (381 mm) wide x 5" (127 mm) deep

- Weight 15 lbs. (6.8 kg)
- Standards: Meet or exceed NEMA EW-1 Class1, CE Marked

3. Requirements to Complete System:

- Power Supply (optional)
- Wire Feeder
- Torch
- Power Input Cables
- Gas Pressure Regulator

B. 755 SynerWeld™ Process Controller with Built-In Cold Wire Feeder

The Thermal Arc 755 SynerWeld™ System features the SynerWeld 2100 Microprocessor Controller with a MPC-21-ICW Cold Wire Feeder integrated into one self-contained unit.



Figure 2-2 Process Controller with Built-In Wire Feeder

1. Standard Components:

- Process Controller
- Built-In Wire Feeder

2. Standard Features:

- 10 Program Memory (battery backup)
- 2 Channel Control with Adjustable Weld Parameters
- Controlled Weld Pulse Rate up to 1000 Pulses/Second
- Large 20 key Membrane-Style Keypad
- Large LCD Backlight 4x20 character display

3. Specifications:

- Processor: AMD AM188, Intel 80C196KC, 16 Mhz.
- Keypad: 20 key, membrane style
- Memory: 10 program (battery backedup)
- Channels: 2 (Current & Wire)

- Display: 4 x 20 Character LCD Backlight
- Power Requirements: 115/230 VAC, 50/60 Hz
- Cord Length: 6 ft. (1.8m)
- Dimensions: 12" (305mm) high x 15" (381 mm) wide x 24" (610mm) deep
- Weight (includes MPC-21ICW Feeder): 60 lbs. (27kg)
- Wire Speed: 5-300 IPM (.1-8m/min)
- Wire Sizes: Solid Wire .030"-0.62" (0.8mm-1.2mm)
- Spool Capacity: Spool 30 lbs. (14 kg)
- Feed Rolls: 2 (1 driven, 1 geared driven idler)
- Standards: Meet or exceed NEMA EW-1 Class1, CE Marked

4. Requirements to Complete System

- Power Supply
- Gas Pressure Regulator
- Torch
- Power Input Cable
- Remote signal to operate Arc ON/OFF (if not controlled from front panel of controller)

C. 775 SynerWeld™ Plasma Welding/Brazing System

The **775 SynerWeld System** is a completely integrated plasma welding/brazing system.



Figure 2-3 Complete 775 SynerWeld™ System

1. Standard Components:

- Ultima™ -150 Plasma Welding System
- SynerWeld 2100 Microprocessor Controller w/Built-In MPC-21-ICW Cold Wire Feed System

2. Standard Features:

- Power Supply w/two 10 ft Gas Supply Hoses
- Quick Disconnect Torch with leads (torch type and leads length as ordered)
- Torch Spare Parts Kit
- Two gallons of Thermal Arc® Coolant
- 10 ft Work Cable w/Lug Connector
- Operating and Service Manuals

3. Specifications:

- Refer to Manual 0-2472 Ultima 150 Operating Manual for Power Supply Specifications
- Refer to Subsection 2.03 -B for Process Controller/ Wire Feeder Specifications

4. Requirements to Complete System

- Gas Pressure Regulator
- Power Input Cable

D. Options & Accessories

1. Remote Controls

- Torch Hand Remote Control
- Remote Synergic Control

2. Cable Assemblies

- 10 ft. Remote Cable (SynerWeld to Power Supply)
- 3 ft. Remote Cable (SynerWeld to Power Supply)
- 10 ft. Remote Cable (SynerWeld to Auxiliary Inputs/Outputs)

3. Wire Feed Guide Attachment Kit

- Manual Torch (to adapt wire feed guide to standard PWH-3A (70) torch)
- Auto Torch

4. Gas Pressure Regulators

- Argon
- Argon Hydrogen

5. Quick Disconnect Adapter Kit

- Enables existing torch to be converted for use with Ultima 150

6. Torch Spare Parts Kits

SECTION 3: INSTALLATION PROCEDURES

3.01 Introduction

This section describes installation of the SynerWeld 2100 Process Controller. These instructions apply to the Process Controller/Wire Feeder only; instructions for the power supply, torches or other components are provided under separate cover.

The complete installation consists of:

1. Site Selection
2. Unpacking
3. Electrical Connections
4. Gas Connections
5. Operator Training

3.02 Site Selection

Select a clean, dry location with good ventilation and adequate working space around all components. The process controller was designed to sit on top of the Ultima-150 power supply or the PS-3000 power supply.

CAUTION

Provide at least 12 inches (300 mm) clearance on each side, and sufficient clearance in front of the unit to allow access to front panel controls (minimum 12 inches or 300 mm).

NOTE

Review the safety precautions in the front of this manual to be sure that the location meets all safety requirements.

3.03 Unpacking

The system is packaged with a carton and packing material to prevent damage during shipping. If more than one component was purchased (ie microprocessor, power supply, torch), each component will be packed separately with its own instructions for installation.

A. SynerWeld 2100 Process Controller Components

Included with the 755 SynerWeld® is the following:

- SynerWeld 2100 Microprocessor Controller w/built-in Cold Wire Feeder
- Input Power Cable with Molded 120V Plug
- Torch with integrated Cold Wire Feed
- Operating/Instruction Manual

B. Unpacking Procedure

1. Unpack each item and remove all packing material.
2. Locate the packing list(s) and use the list to identify and account for each item.
3. Inspect each item for possible shipping damage. If damage is evident, contact your distributor and/or shipping company before proceeding with system installation.

3.04 Primary Input Power Requirements

The Process Controller accepts input voltages from 115V-230VDC. The Process Controller is factory-wired for low voltage operation 115(110) volts.

To reset the process controller for 230VDC operation:

1. Using a 5/32" allen wrench, remove the two front screws from the side panels of the enclosure cover then slide the cover up and back.
2. Locate the Input Voltage Receptacle on the right side of the unit.
3. Insert a small flat head screwdriver and turn it until the arrow lines up with 230 (220) voltage.
4. Replace the enclosure cover.
5. Replace the input cable and plug at the rear of the unit with properly rated hardware. For wiring requirements, refer to Appendix IX, Circuit Protection & Wiring.

CAUTION

The primary power source, power cable, and plug all must conform to local electrical codes and recommended circuit protection and wiring requirements.

NOTE

Input power connections can be made directly to a properly fused disconnect or by using a plug which conforms to the recommended ratings.

3.05 Remote Interface Connections

A. SynerWeld w/ Cold Wire Feed

NOTE

For proper connections, refer to the Interface Diagrams in Appendix V, VI and VII.

1. Remote Input Signals/Interface

a. Start/Stop Sequence

The START/STOP of the weld sequence can be operated from the front panel of the SynerWeld 2100 Controller using the START/STOP Switches, or can be controlled remotely by interfacing into the TB-2 terminal strip located on left rear of the SynerWeld 2100 w/ Wire Feed unit.

b. Wire Stop

The feeding of the wire can be stopped (paused) during the weld sequence if it is determined there is too much wire being added, by interfacing into the TB-2 terminal strip.

c. Arc Sense

By using an Arc On or Weld Current detect signal provided by the power supply interfaced into the TB-2 terminal strip allows for the Process Controller to prohibit continuation of the weld sequence until it has detected the input Arc Sense signal has been received.

2. Remote Output Signals/Interface

a. Analog 0-10 V DC Current Control

The Analog signal controls the current output and is supplying the 0-10V DC signal to the power supply. It is controlled remotely by interfacing into the TB-2 terminal strip located on left rear of the SynerWeld 2100 w/Wire Feed unit.

b. Contactor Closure

The contactor closure controls the starting and stopping of the DC current and is controlled remotely by interfacing into the TB-2 terminal strip located on left rear of the SynerWeld 2100 w/Wire Feed unit. Following the Interface Diagram, the Analog 0-10VDC signal and contactor closure to the power supply must be interfaced from the TB-2 terminal strip located on left rear of the SynerWeld 2100 w/Wire Feed unit using the remote interface cable.

c. Auxiliary Contact Signals

There are two N/O time delay Auxiliary contacts available for controlling other devices such as torch motion, turning positioners, holding clamps and etc. See voltage and current ratings on Interface Diagrams.

d. Preweld/Postweld N/O Contacts

There is one N/O contact signal available for controlling other devices such as torch motion, turning positioners, holding clamps and etc. See voltage and current ratings on Interface Diagrams.

B. SynerWeld 2100 Process Controller

NOTE

Refer to the Interface Diagrams in Appendix V, VI and VII.

1. Remote Input Signals/Interface

a. Start/Stop Sequence

The START/STOP of the weld sequence can be operated from front panel of the SynerWeld 2100 Controller using the START/STOP Switches or can be controlled remotely by interfacing into the Auxiliary Cable assembly and connecting to Auxiliary connection located on bottom of the SynerWeld 2100.

b. Arc Sense

By using an Arc On or Weld Current detect signal provided by the power supply interfaced into the Auxiliary Cable assembly and connecting to Auxiliary connection, allows for the Process Controller to prohibit continuation of the weld sequence until it has detected the input Arc Sense signal has been received.

2. Remote Output Signals/Interface

a. Analog 0-10 v DC Current Control

The Analog signal controls the current output and is supplying the 0-10V DC signal to the power supply. It is controlled remotely by Remote Cable assembly and connecting to Channel 1 connection.

b. Contactor Closure

The contactor closure controls the starting and stopping of the DC current and is controlled remotely by interfacing into the Remote Interface Cable assembly and connecting to Channel 1 connection.

c. Auxiliary Contact Signals

There are two N/O time delay Auxiliary contacts available for controlling other devices such as torch motion, turning positioners, holding clamps and etc. and are obtained by interfacing into the Auxiliary Cable assembly and connecting to Auxiliary connection. See voltage and current ratings on Interface Diagrams.

d. Preweld/Postweld N/O Contacts

There is one N/O contact signal available for controlling other devices such as torch motion, turning positioners, holding clamps and etc. and are obtained by interfacing into the Auxiliary Cable assembly and connecting to Auxiliary connection. See voltage and current ratings on Interface Diagrams.

3.06 Drive Roll Installation

The drive roll has two grooves: the small groove feeds 0.035 in. diameter wire, the large groove feeds 0.045 in. wire. The groove nearest the gear motor feeds the wire.

If the required groove is not correctly positioned, perform the following:

1. Release the pressure drive roll levers and lift the assemblies upward.
2. Remove shoulder screw holding each drive roll to the gear.
3. Reverse the drive roll on the drive roll shaft.
4. Replace the screws and tighten.
5. Secure the pressure drive roll assembly.

3.07 Wire Spool Installation

Refer to Section 4.12, Preparation for Welding.

SECTION 4: OPERATION

4.01 Introduction

This section provides a description of the operating controls and procedures for the SynerWeld 2100 Process Controller and Cold Wire Feeder.

4.02 Operating Controls

The SynerWeld 2100 Controller has the following operator controls: the Start button, Stop button, Emergency Stop button, Power On/Off switch, and the twenty digit keypad.

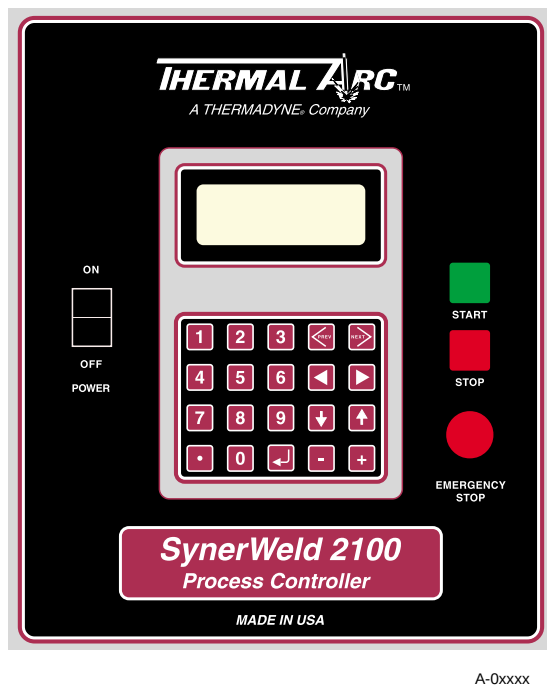


Figure 4-1 SynerWeld 2100 Control Front Panel

A. Power On/Off

This rocker switch turns the input power on or off to the SynerWeld 2100 control. The power goes to the + 5 Vdc power supply and to the motor control of the wire feeder. The switch is electrically located before the fuses. There is a fuse located internally on the right side of the enclosure. Power can be turned off in most screens. If you are in the midst of modifying a program, the old values will be retained. You should not turn power off in the middle of a weld - external equipment may be damaged or continue its operation uncontrolled.

B. Start Button

The green start push button is used to initiate the weld sequence when used in automated operations. It is also used in the JOG mode to start a maintained "jog" motion of wire feed.

C. Stop Button

The red stop push button is used to sequentially stop the weld sequence in automated operations. When pressed, it will begin the downslope portion of the weld. It is also used in the JOG mode to stop a maintained jog of wire feed.

D. Emergency Stop

The emergency stop button is used to stop any activity function of the Process Controller instantly. When pressed, all action is stopped and can not be restarted until after the button has been disengaged.

E. 20 Digit Keypad

The keypad provides the main method of controlling the SynerWeld 2100 control. The Number Keys are exclusively for numerical input. Other keys may have multi-purposes according to the particular program activity.

To enable you to use the SynerWeld 2100 control as easily as possible, certain key operations always have the same action irrespective of the particular screen display in use at the time.

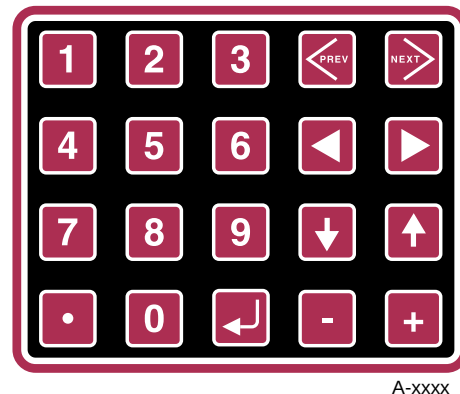


Figure 4-2 Process Controller Keypad



This key is used during programming to enter the data into memory. When you have inputted the appropriate data, pressing the ENTER key will record the data and move you to position for the next data entry. At

the last line of a display, after the last numeric data has been inputted and entered a second press of the ENTER key will move you to the next screen display.

All Modes: Saves entered information. Allows continuation to next numeric entry. Activates a disabled function.

PREVIOUS

From any point in any screen display, pressing PREV will take you to the previous screen (except when you are in the middle of a data entry and have not yet entered the value).

All Modes: Moves back to Previous screen.

NEXT

Once you have chosen a programming option, pressing the NEXT key at any point in a screen display will take you immediately to the next screen display.

All Modes: Moves forward to Next screen.

LEFT ARROW

During the entry of a value, this key, when pressed, will erase the entered value to allow a revised value to be entered. During welding sequence this key will Synergically decrease current and wire speed values.

All Modes: Erases entered value.

Run Mode: Decreases Synergic Current/Wire Values.

Modify Mode: Moves cursor to Left. Moves cursor Page Up.

RIGHT ARROW

During the entry of a value, this key, when pressed, will erase the entered value to allow a revised value to be entered. During welding sequence this key will Synergically increase current and wire values.

Modify Mode: Moves cursor to Right. Moves cursor Page Down.

Run Mode: Increases Synergic Current/Wire speed values.

INCREASE

This key will increase output of selected parameter, current or wire, during welding sequence. Prior to Start, weld sequence can be used to Jog wire forward.

Run Mode: Increases output of selected parameter.

Jog Mode: Jogs wire forward.

DECREASE

This key will decrease output of selected parameter, current or wire, during welding sequence. Prior to Start weld sequence can be used to Jog wire reverse.

Run Mode: Decreases output of selected parameter.

Jog Mode: Jogs wire in reverse.

UP ARROW

This key will move the cursor or select arrow up to the previous line of the screen display. When the top line of a display is the one at which the cursor is positioned, this key will take you to the start of the previous screen (just like the PREV key).

All Modes: Moves cursor to previous line.

Modify Mode: Starts @ A to B,C,D....

Jog Mode: Changes Jog direction to forward.

DOWN ARROW

This key will move the cursor or the select arrow down to the next line of the screen display. When the cursor is at the end of the last line of a screen display, this key will take you to the next screen (in the same way as the NEXT key).

All Modes: Moves cursor to next line.

Modify Mode: Starts @ Z, to Y, X, W...

Jog Mode: Changes Jog direction to reverse.

DECIMAL POINT

Places decimal point entry. Erases entered values. Disables an Activated function.

All Modes: Places Decimal point entry. Erases entered values. Disables an activated function.

4.03 Getting Started

A. Welcome Screen

1. To turn on the Weld Sequencer, press the ON Button located on the Front Panel. The Welcome Screen displays, as shown in Figure 4-3.



Figure 4-3 Welcome Screen

GETTING HELP

Whenever you need to contact Thermal Arc® Technical Support with questions or problems, be sure to have your Version Format information ready. Providing this information will aid the factory in producing a timely and accurate response.

For Version Format (product code and date firmware installed) information, press (.) (decimal point) at the Welcome Screen. Releasing the (.) will return to the Welcome Screen.

B. Main Options Menu

The Main Option Menu is shown in Figure 4-4. This screen provides three functions: Weld Sequence, Jog Channel, and System Configuration.

Weld Sequence - for operating, selecting, adding, modifying, copying, and viewing a weld sequence. Most of your time will be spent here.

Jog Channel - for wire and gas jog control. Use this option whenever you want to use the jog wire functions to thread the wire through the wire conduit preparing to add wire to weld.

System Config - for initial setup of channel controls, calibration, password controls. Use this in initial setup, or whenever you need to change the configuration of the system.

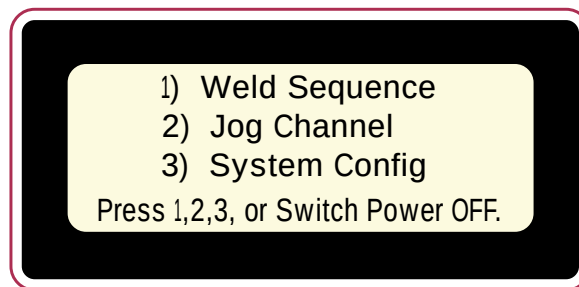


Figure 4-4 Main Options Menu

C. Where to Start

If this is your first time using the 2100 Process Controller system, go to Section 4.04, *System Configuration*, and view the setup of your controls.

NOTE

The SynerWeld 2100 is factory-configured for use with the Thermal Arc Ultima-150. If another power source is to be used, it will require changes to the System Configuration. Refer to Section 4.04 for instructions on configuring the system.

Once you have a properly configured system, follow the instructions in Section 4.06, **Create/Modify a Weld Sequence**.

The handy **Process Controller Keypad Reference Guide** in Appendix III can help you get from field to field and screen to screen. The **Flowcharts** in Appendix VIII provide a useful “roadmap” through the system. The **Weld Sequence Profile** in Appendix I provides an excellent reference for the different stages of a weld sequence.

Once you have created a program, refer to Section 4.09, **Run Weld Sequence** for instructions on running a program. If after you run your program you find you need to make changes to it, return to Section 4.06, **Create/Modify a Weld Sequence** and make the required changes.

If you want to create a new weld sequence which is only slightly different from an existing sequence, your best bet is to use the **Copy Program** option, then use the **Modify Program** option to make changes. To simply look at a weld sequence program without the ability to make changes, use the **View Current Program** option.

To use the same weld sequence program that was last used at your work station, turn on the weld sequencer, wait 15 seconds, and let it automatically select the **Default Program** which will be the last program that was selected. To set a new default program, use the **Set Current Program** option.

4.04 System Configuration

Prior to using the Weld Sequence Controller, verify the configuration of your system to ensure that all components are communicating with each other. **The SynerWeld 2100 Process Controller will be configured to be used with the Thermal Arc® Ultima-150 Plasma Welding System.** If the SynerWeld 2100 is to be used with another power source such as the PS-3000, the Process Controller will need to be configured by the user. Refer to Section 4.04C, Calibration for more information.

A. Creating a Password Code

1. Select option 3, System Config, at the Main Options Menu Screen.

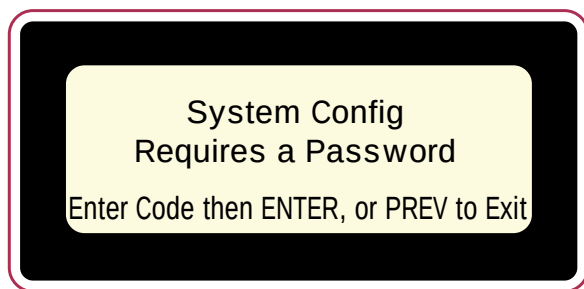


Figure 4-5 Password Screen

2. To access System Config requires a password. If a password has not been entered and saved, press "0" which is the default entry, then press Enter. If a password has already been entered and saved, enter that password. Password verified.

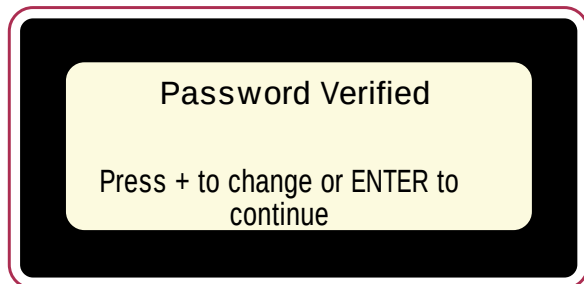


Figure 4-6 Change Password Screen

3. Press (+) to enter New or Change System Password.
If you already have a password, simply press Enter and the screen in Figure 4-7 will display. Continue with subsection B.
4. Type in a valid password (maximum 7 digits), and press Enter. Note: you will see a (*) for each digit entered up to 7 entries.

5. Re-enter your password for verification and press Enter.

New password acknowledged.

NOTE

Record your new password some place where it can be obtained.

6. Press Enter.

PASSWORD ENTRY

There are hard-coded passwords to gain access and to clear Process memory described situation exists as follows.

1. *There is a password that will reset only the user password to "0". This password is used if the user inadvertently changes the user password or forgets what the password is. Always record your password after changing it.*
2. *There is a password that will allow a user to gain entry to both configuration data and weld program data without changing any data or passwords. This password is most often used by the setup person. The setup person can have access for weld program setup or Process calibration.*
3. *There is a password that will reset the user password to "0" and clear the weld program memory area. This password is used when upgrading the SynerWeld 2100 or when adding certain options. **Be sure to record all weld and configuration data before using this password.***

NOTE

You must contact Thermal Arc® to obtain this password information.

B. Channel Controls

The Channel Control Screens allow for additional performance characteristics to be entered.

1. Select option 1, Channel Controls.

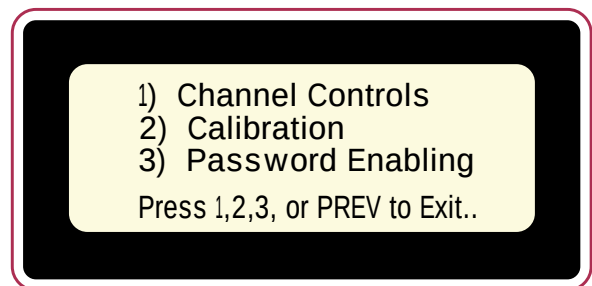


Figure 4-7 System Configuration Menu Screen

1. Closed Loop Sensitivity

This option allows for setting the closed loop sensitivity of each channel. Closed looping is a feedback from the motor control on the Wire Feeder or Current Defect device for power supply (optional) that constantly lets the Process Controller know the output status of each device. Each channel is monitored 50 times per second and then modified if necessary up to 4 times per second.

If the feedback from the devices differs from the programmed parameters, the analog output command signal is then modified. The number entered is a percentage from 0.0 to 99.9. The percentage which is entered informs the Controller what percent of error should be adjusted for with each modification.

We suggest trying a sensitivity value between 2% and 10% as initial values. At 10%, up to 40% of the error will be added each second. At this selected rate, overshoot and oscillation can be avoided due to acceleration and deceleration times.

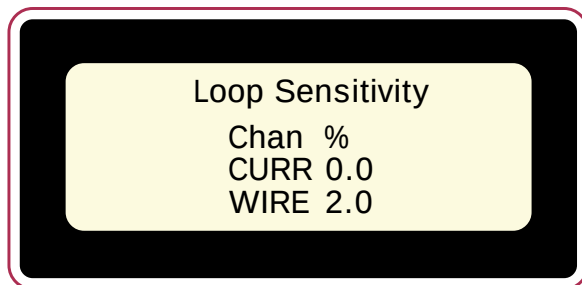


Figure 4-8 Loop Sensitivity Screen

NOTE

Entering a value of 0.0% in the sensitivity setting will cause the channel to become an OPEN loop channel. No error factor is to be added or subtracted to compensate the output for any error.

NOTE

Closed looping of wire feed is standard on SynerWeld 2100. Close looping of current is an option. Contact Thermal Arc for additional information.

2. Closed Loop Delays

Closed Loop Delay is providing a delay time before the systems starts monitoring the feedback signals. During the entered delay, the channel operates as an OPEN loop system. Once the delay times out, the channel becomes CLOSED loop at the sensitivity value entered. The delay allows for all the feedback parameters to become stable after first starting before any adjustment is to begin.

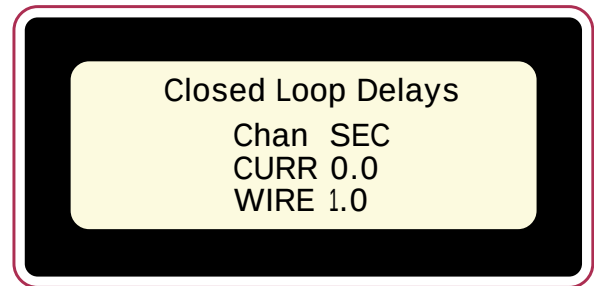


Figure 4-9 Closed Loop Delays Screen

3. Trim Limits

Trim limits allows for the setting of the maximum or minimum limit the weld current or wire feed rate can be adjusted during weld sequence using the (-) or (+) keys from Keypad.

Example: If a weld current of 100 amps is programmed in program, and the Trim Limit is set at 10%, this would allow the weld current to increase or decrease while welding by (+/-) 10%. Thus the maximum current could be changed up to 110 amps and the minimum current could be changed down to 90 amps using the (-) or (+) keys from keypad.

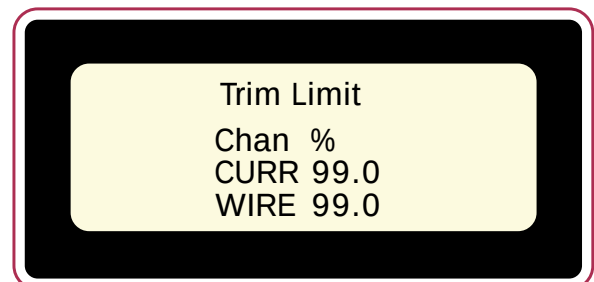


Figure 4-10 Trim Limit Screen

NOTE

In the Trim Limit Screen, the limits can be set up to 99%.

4. Synergic Stepping

By pressing a single key during the weld, two or more parameters can be changed synergically (simultaneously, together) at a predetermined ratio, or relationship.

If values are entered in the synergic step option, there will be two additional keys active on the key pad during the weld. These keys are the LEFT ARROW key which will increase programmed parameters and the RIGHT ARROW key which will decrease programmed param-

eters. Pressing and holding the keys will continually change the parameters until the upper or lower limit is reached.

The upper/lower limits are determined by the trim limits as set in the Trim Limits Screen in the Channel Controls Sub-section. If any parameter hits a limit while a synergic key is pressed, all parameters will stop changing until the opposite synergic key is pressed.

If the synergic function is used during a weld, the increased or decreased parameter values will be reset back to the original programmed values at the end of the weld. If new values are to be retained, which can be viewed on screen during welding operation, make the value change in the Create/Modify of a program.

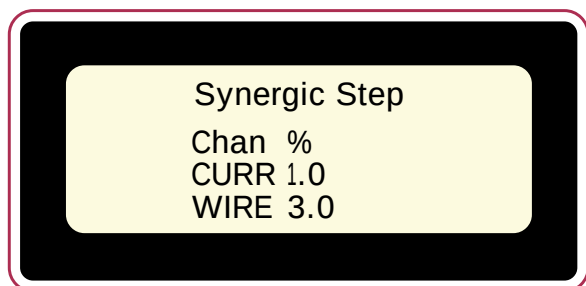


Figure 4-11 Synergic Step

For example:

If a weld program is running with the following parameters:

Weld Current 100 Amps
Wire 40 IPM

And during the weld the operator may have to increase the parameters due to part irregularity by as much as:

Weld Current 150 Amps
Wire 60 IPM

The operator can bring all the parameters up at the same time with the proper relationships by pressing the RIGHT ARROW key, if the correct values are entered in the Synergic Step Screen. Pressing the LEFT ARROW key will bring all the levels down at the same rates.

C. Calibration

Calibration allows for the configuration of the power source and wire feeder characteristics. The processor controller needs to know the minimum and maximum output of the weld current and wire feed speeds to allow for accurate control of these parameters when programmed into weld sequence.

The SynerWeld 2100 Process Controller is configured for use with the Thermal Arc® Ultima-150 Plasma Welding System. Typical output parameters for the Ultima-150 are shown in Figure 4-13.

If the SynerWeld 2100 is to be used with the PS-3000 Power Supply, the CURRENT Calibration Screen should be set with the following initial values:

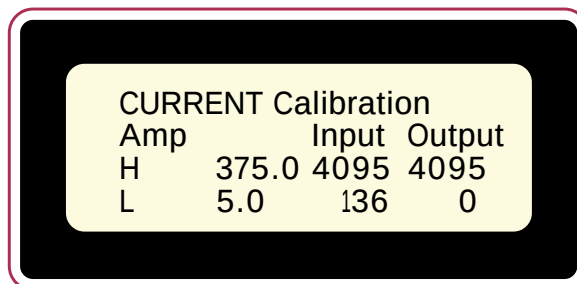


Figure 4-12 PS3000 Current Calibration

NOTE

If your actual current output is different from the programmed output, adjustments can be made using the following calculation:

Actual Current Output divided by Programmed Current Output equals Value

Value times Displayed Output equals New Output

For example:

You have an Ultima-150 and your Process Controller is configured using the same values as shown in Figure 4-13. When you begin operation, your actual current is only 148 amps rather than 150 amps. Applying the formula above produces the following:

$$148/150 = 0.98$$

$$0.98 \times 4095 = 4040$$

Replace the output value of 4095 on the screen with the new value of 4040. If having run the program again you find that another adjustment needs to be made, repeat this calculation using the new values. This calculation can be applied over and over until the desired current output is achieved.

In the CURRENT and WIRE Calibration Screens shown in Figures 4-13 and 4-14, both the calibration input and output values have been placed on the same screen.

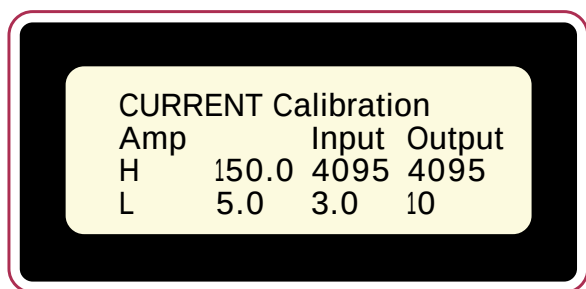


Figure 4-13 Current Calibration Screen

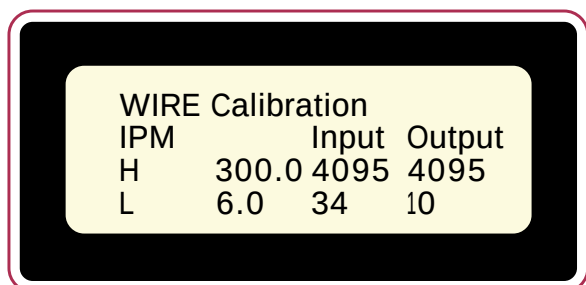


Figure 4-14 Wire Calibration Screen

D. Password Enabling

The Password Enable feature allows for the Password to be Enabled or Disabled during the Create/Modify mode. The disabling of the Password in the Create/Modify mode simplifies data entry when creating or making repeated changes to a program. It is recommended to enable the Password when in the Run mode to ensure inadvertent changes to program are not made.

NOTE

Entry into the System Config mode always requires a Password. Refer to Section 4.04A for information on creating a password.

4.05 Weld Sequence Option

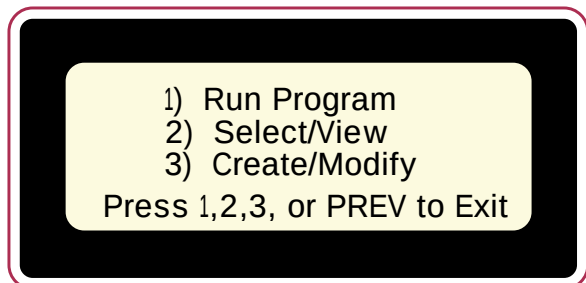


Figure 4-15 Weld Sequence Menu Screen

NOTE

Refer to Section 4.09 for Run Program information and Section 4.08 for Select/View a Weld Sequence information.

4.06 Create/Modify a Weld Sequence

This allows for the creating or modifying (editing) of weld programs.

1. At the Weld Sequence Menu Screen, press option 3 to go to Create/Modify mode.

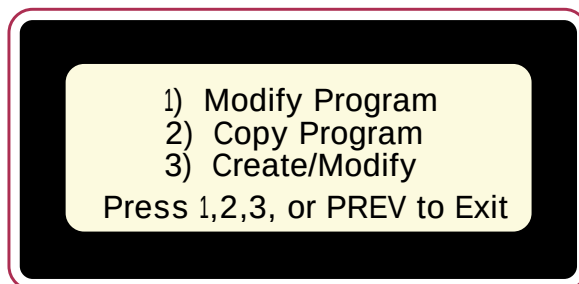


Figure 4-16 Create/Modify Weld Sequence

2. Enter your Password, if required. If the password feature has been enabled in your System Configuration Setup, you will be required to enter a Password code here. The password you enter will be verified by the Controller. Once verified, press ENTER to continue.

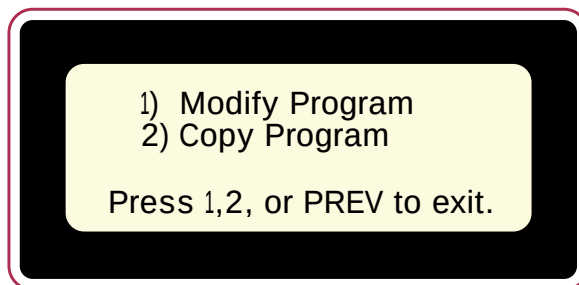


Figure 4-17 Modify/Copy Program

3. Press 1 to Modify program. The cursor arrow will default to the last selected program.
4. To create a new weld program, enter the numerical value of the desired program (0-9) or move the cursor using the UP or DOWN arrows until it is next to a program number that has not been previously used (UNUSED) and then select enter. Note: Use "0" to select program #10. If there are no more UNUSED programs, select a program to overwrite and use the instructions in Modify a Weld Sequence. A maximum of 10 programs can be stored in memory.

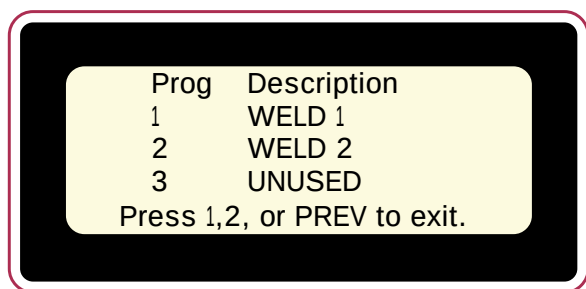


Figure 4-18 Program Description Screen

5. To enter a program description, use the guide provided in Figure 4-18 to move the cursor. The DESCRIPTION field allows for up to 10 alphanumeric characters.
6. Press the ENTER or NEXT key to go on to the Channel Status Screen.

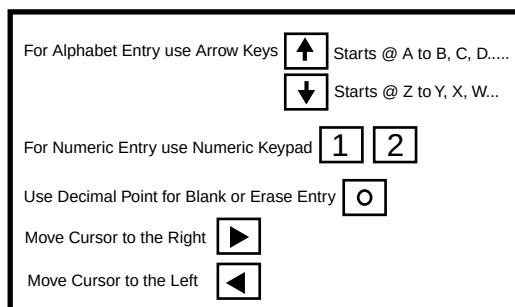


Figure 4-19 Data Entry Guide

B. Channel Status - Current/Wire

Channel Status allows for the selection of Current or Wire to be controlled by the analog output from the Process Controller. The WIRE channel may be disabled to run programs without wire feed. If both channels are disabled at once, the program will not run.

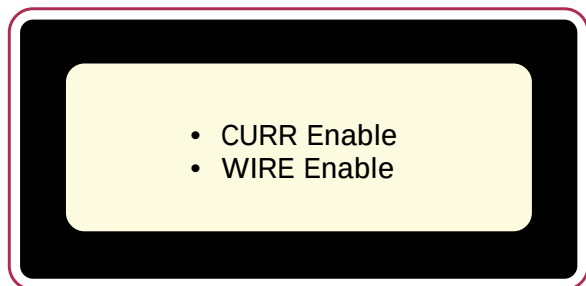


Figure 4-20 Channel Status Screen

Pressing the ENTER key will enable the function that the cursor is pointing to and the (.) key will disable that function. The up and down arrow keys will move the cursor. Descriptions of these functions follow:

C. Arc Sense Enable

With this function enabled, the weld sequence will not proceed until a welding arc is detected at the beginning of the weld. The Arc On or Weld Current Detect signal is usually detected by the power supply which signals the 2100 to proceed with the weld sequence. If there is not an “arc on” detector interfaced to the Processor, the Arc Sense function should be disabled.

The Arc Sense function can be disabled to run the weld program without welding. If the welding power source is turned off and the Arc Sense disabled, the weld program can be run in the “DRY RUN” mode. The program will go through all the timed sequences and turn on the auxiliary devices without waiting for the arc on signal.

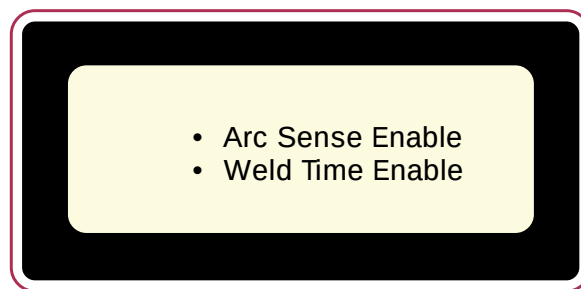


Figure 4-21 Arc Sense/Weld Time Enable

D. Weld Time Enable

With the Weld Time function enabled, this allows the time from end of upslope to start of downslope to be a timed function.

With the Weld Time function disabled, the operator will control the weld length by pressing the STOP pushbutton at the end of the weld, or, the 2100 can be remotely signaled to end the weld through the use of a limit switch or other device. When the Weld Time function is disabled, the fields for entering the weld time and the taper time in the weld program will be skipped.

If the Weld Time function is disabled after it was previously enabled with weld and taper times entered, those values will disappear from the screen but will be saved in the event that the Weld Time function is re-enabled.

NOTE

Taper Current/Time is explained in detail in Section 4.06-I.

E. Auxiliary Status Outputs

There are two digital outputs (relay contacts available at the Auxiliary amphenol connector or 2100 Process Controller only, and on TB-2 Terminal strip Controller/Wire Feeder) that can be programmed to turn on during the weld. These outputs can be programmed to switch on and off auxiliary devices such as magnetic or mechanical oscillators and auxiliary travel or turning devices.

The auxiliary outputs can be programmed to turn on after a start delay (the start delay time starts from the beginning of the “arc on” signal) and to turn off after a stop delay time (the stop delay time starts at the beginning of downslope).

NOTE

See Appendices V - VII for schematic interface of Auxiliary Outputs.

Enable or disable the Auxiliary Outputs as desired. Be sure it is known what the outputs control before enabling. The Start and Stop Delays times information can be found at the end of this section.

The auxiliary outputs are programmed as follows:

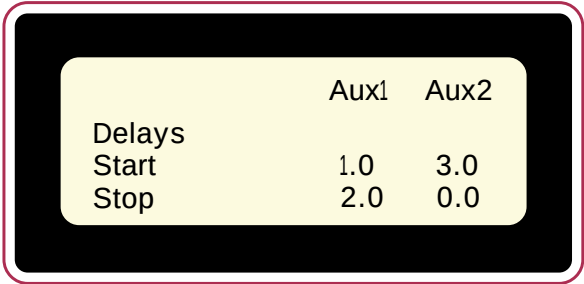
1. At the Auxiliary Status Screen, place the cursor on the AUX 1 line, and press the ENTER key to enable this feature.
2. Move the cursor down to the AUX 2 line, then press ENTER to enable the AUX 2 output.

As in other similar screens, pressing the ENTER key will enable the function next to the cursor and pressing the (.) key will disable that function.

3. Press the NEXT key when done with the enable/disable functions.

If the Auxiliary Outputs are enabled, start and stop delay times can be entered in the Auxiliary Delays screen using the numeric keys. The Start Delay starts timing at the initiation of the welding arc and the Stop Delay starts timing at the beginning of downslope. After the start delay times out the output will energize and when the stop delay times out the output will de-energize.

4. To enter the delay values, type the required number at the flashing cursor using the decimal point if required, then press the ENTER key. The delay range for both start and stop delays is 0.0 to 99.9 seconds. After the start delay times out, the output will energize and when the stop delay times out the output will deenergize.



	Aux1	Aux2
Delays		
Start	1.0	3.0
Stop	2.0	0.0

Figure 4-22 Auxiliary Status Screen

5. When the appropriate time delays have been entered in the above fields, press the NEXT key to display the next screen.

F. Time Allotment for Preweld and Postweld

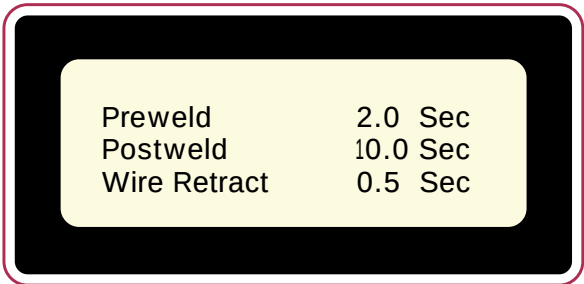
The time programmed into Preweld will delay starting of the welding arc. An output signal will be provided at sequence Start allowing a function to be performed prior to starting of arc and continued throughout the duration of sequence and terminated at end of Postweld. This feature could be used for operations such as clamping sequence, torch positioning sequence, indexing part, positioning protective lenses, etc...

NOTE

See Appendices V - VII for schematic interface of Auxiliary Outputs.

Preweld

1. At the Time Allotment Screen, enter a time value in seconds for the desired amount of Preweld, using the numeric keys with the (.) key if necessary. Then press the ENTER key. Preweld range is 0 to 99.9 seconds.



Preweld	2.0 Sec
Postweld	10.0 Sec
Wire Retract	0.5 Sec

Figure 4-23 Times for PreWeld and PostWeld

Postweld

2. Enter a time value in seconds for the desired amount of Postweld, using the numeric keys with the (.) key if necessary. Then press the ENTER key. Postweld range is 0 to 99.9 seconds.

Wire Retract

3. Enter the required Wire Retract time in seconds. This value may vary some depending on the distance from the wire guide tip to the weld puddle. Typical time range is 0.4 to 0.7 seconds. When the wire channel is stopped during the weld program, the wire will reverse at high speed for this period of time, retracting away from the weld puddle before turning off the welding arc so as not to freeze in the weld puddle at the end of the weld.

G. Pulse Status Current

In the Pulse mode, the current is pulsed from a peak value to a background current (less than peak) at a selected frequency. The SynerWeld 2100 can pulse at frequencies from 0.2 to 999 pulses per second.



WARNING

At frequencies greater than 60 Hz, the pulse frequency becomes audible and increases as frequencies are increased.

1. At the Pulse Status Screen, select to Enable or Disable Pulse Status for Current. If enabled, pulse parameters will display, as shown below:

Puls Start Dly	2.0
Puls Stop Dly	0.0
Frequency	15.0
On% 60	Back% 30

Figure 4-24 Pulse Status Parameters

NOTE

If Pulse Status is disabled, neither weld current or wire can be pulsed.

Puls Start Dly

2. Enter the amount of time desired from arc initiation to the beginning of weld current pulsation in the Pulse Start Dly field. This value can be from 0.0 to 99.9 sec-

onds and will start timing as soon as the arc strikes. The weld current will be at programmed values without pulsation until the pulse start delay times out.

Puls Stop Dly

3. In the Puls Stop Dly field, enter the amount of time desired from the beginning of downslope until weld current pulsation stops. The Pulse Stop Delay value can be from 0.0 to 99.9 seconds and starts timing at the beginning of downslope (when the Weld Timer times out, when the Downslope Limit Switch is encountered, or when the STOP pushbutton is pressed). After the pulse stop delay timer times out, the weld current will continue at the programmed values of downslope and final current without pulsation.

NOTE

*It is recommended to have the **Pulse Stop Delay** time value equal to or greater than the Downslope time value. If the Pulse Stop Delay value is less than the Downslope time value, the weld current will resume to downslope value at time of Delay timeout resulting in a higher current level than that realized in pulse mode.*

Frequency

4. Enter the desired Frequency of weld current pulsation in this field. This value can be from 0.2 to 999 pulses per second. A pulse is considered to be a complete cycle, that is the total Peak current time plus the total Background current time is a complete cycle. Therefore, there are 15 Peak periods of weld current and 15 Background periods every second if 15 pulses per second is entered in this field.

On%

5. In the On% field, enter the amount of Peak Current Time as a percentage. A value of 5% to 99% is allowed in this field.

The amount of Peak Current time is entered as a percentage of cycle time is entered in this field. If 60% is entered, it means that for each pulse cycle the weld current will be at Peak, 60% of the time and the weld current will be in Background for the remainder of the cycle or, 40% of the time.

Back%

6. In the Back% field, enter the Background Current value. A value of 5% to 99% is allowed in this field.

The Background Current value is entered in the Back% field. This is a percentage of the Peak value as entered in the Weld Curr field in the weld current programming screen below. If pulsing is active during a weld current sloping segment (during Upslope, Taper or

Downslope), the Background Current is always a percentage of the immediate weld current value. The above also holds true for Taper and Downslope segments.

NOTE

All of the pulsing parameters will be retained if the pulsing feature is DISABLED. In this way, pulsing can be disabled and then re-enabled without having to reenter the original pulsing values.

H. Pulse Status Wire

1. At the Pulse Status-Wire Screen, select to Enable or Disable Pulse Status for Wire. If Enabled, the screen shown below will display.

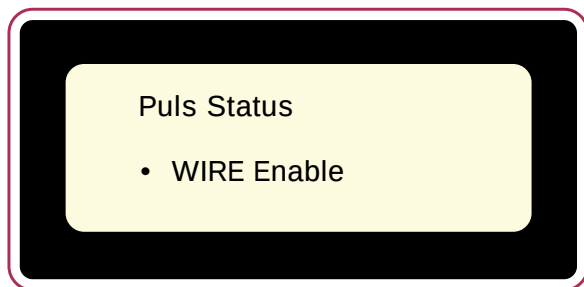


Figure 4-25 Pulse Status Wire Enable Screen

Wire Pulse BG %

2. In the Wire Pulse BG % field, enter the Background wire % value. A value of 5% to 99% is allowed in this field.

In the Pulse Wire mode, the wire is pulsed at peak value at a selected frequency less than 5 Hz. This allows for improved weld puddle control when welding out of position or welding on a thin edge that requires a build up of filler material at a low current input, by synchronizing the wire to be feed into weld puddle only at peak current.

NOTE

The wire cannot be pulsed if Current Pulse is disabled. If Pulse Status-Wire is disabled, wire feed cannot be pulsed. Typically wire feed speeds must be increased in pulsed-wire mode.

Initial CURR

1. Enter an Initial Current value in AMPS that is equal to or greater than the Minimum current value shown in the Section 4.04, System Configuration. This will be the weld current value that will be set when initiating the welding arc and will remain at this value after the arc is struck, for the time that is entered in the Initial Time field.

The value entered in this field must be within the maximum and minimum values set in the Configuration / Calibration screen.

For example: If the minimum current value for the process is set at 5 amps, and a current value of 2 amps is entered into this field, the screen will indicate that too low a value has been entered: where the “L” on the first line indicates a low limit and the 5.0 indicates the process minimum value allowed. If too high a value is attempted, an “H” will appear on the first line along with the process maximum value allowed.

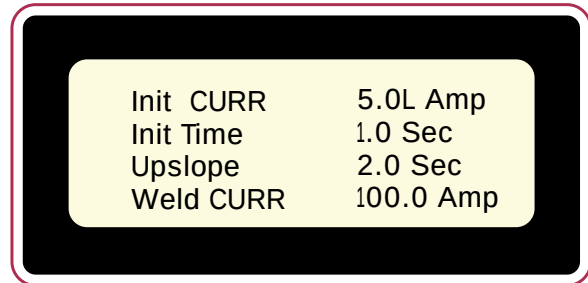


Figure 4-26 Pulse Status Screen

2. In either case above, press ENTER (or any key) one time then enter the correct value.
3. If modifying a previously entered value, and either limit is exceeded and the original value is forgotten, press PREV (either once or twice depending on the status of the line) to get to the previous screen, then press NEXT and the original value will be restored.

Initial Time

4. Enter an Initial Time value in Seconds. The welding arc will remain in Initial CURR for the amount of time entered in this field. The Initial Time starts when the SynerWeld 2100 receives the ARC ON signal. A time value of “0” is allowed in this field.

Upslope

5. Enter an Upslope time value in Seconds. The weld current will slope linearly from the Initial CURR value to the Weld CURR value in the amount of time entered in this field. The Upslope Time starts when the Initial Time ends. A time value of “0” is allowed in this field.

Weld CURR

6. Enter a Weld Current value in Amps. This is the value that the weld current will Upslope to and that will be used during the main course of the weld. This value is also considered to be the Peak Current value if the pulsing option is installed and enabled (See Subsection 4.04H, Pulse Status Wire).

The value entered in this field must be within the maximum and minimum values set in the Configuration/Calibration screen.

NOTE

A Current value of "0" is NOT allowed in this field

Example:

If the maximum current value for the Process is set at 150 amps, and the operator tries to enter 165 amps in this field, the screen will indicate that too high a value has been entered.

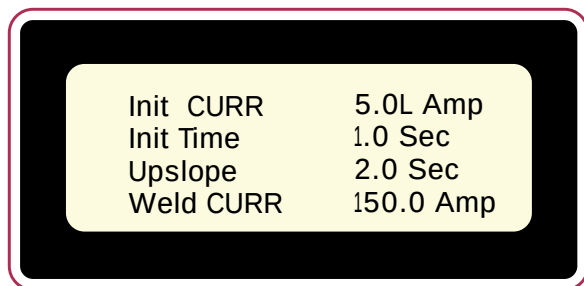


Figure 4-27 Example Screen

Where the "H" on the fourth line indicates a high limit and the 150.0 indicates the Process maximum value allowed.

If too low a value is attempted, an "L" will appear on the fourth line along with the Process minimum value allowed.

- b. In either case above, press ENTER (or any key) one time then enter the correct value. If modifying a previously entered value, and either limit is exceeded and the original value is forgotten, press PREV (either once or twice depending on the status of the line) to get to the previous screen, then NEXT and the original value will be restored.
- c. When the appropriate values have been entered above, press the NEXT key.

I. Weld Time

NOTE

The screen in Figure 4-28 will be displayed only if **Weld Time** was **ENABLED** initially.

If **Weld Time** was **DISABLED**, this screen will not appear. The **Final Weld** screen shown in Figure 4-29 will display instead.

If the Weld Time is enabled, this screen allows you to view the weld and taper current settings and times.

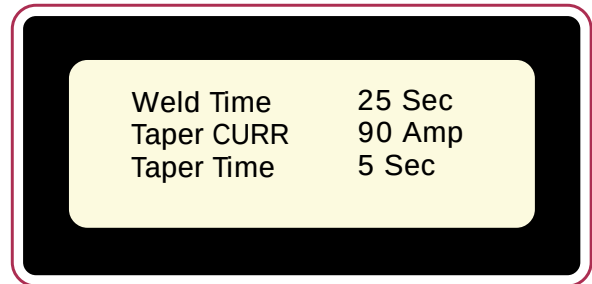


Figure 4-28 Weld Time Screen

1. Enter a Weld Time value in Seconds.

This time starts at the end of Upslope. When this time segment times out, WELD TAPER time will begin. The total elapsed time of the weld will be **INITIAL + UPSLOPE + WELD + TAPER + DOWNSLOPE + FINAL** times.

Taper CURR

2. Enter the Weld Taper CURR value in Amps.

This is the value that Weld Current will slope to when the Weld Timer times out. The weld taper current can be either higher or lower than the weld current value. The length of the slope is determined by Taper Time (below).

Taper Time

3. If the Weld Taper Time is set to 0 to disable the taper function, it is best to enter a value in the Weld Taper CURR field to ensure a smooth transition from weld current to downslope. This value should be the same as the weld current value.

The Weld Taper function is useful in circumferential applications where it is desirable to reduce the heat input near the end of the weld because of the temperature build up during the weld.

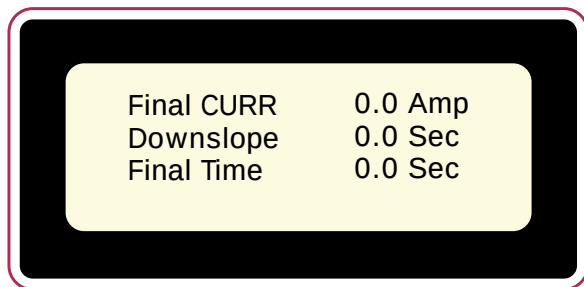
The Weld Taper Current value is limited by the Process maximum and minimum limits set in Configuration/Calibration as in the above examples for Initial and Weld Currents.

4. Enter a Weld Taper Time in Seconds.

This time will begin at the end of Weld Time. When this time times out, Downslope will begin.

The Taper Time controls the rate of slope between the Weld Current value and the beginning on Downslope value. If the Weld Taper function is not desired, a **0** can be entered in this time field, however a **non-zero** value should always be entered in the Taper CURR field (See Weld Taper Current).

J. Final CURR



Final CURR	0.0 Amp
Downslope	0.0 Sec
Final Time	0.0 Sec

Figure 4-29 Final Current Screen

1. Enter a Final CURR value in Amps.

This is the value that the welding current will slope to from the end of Taper CURR (or from the end of Weld Current if no Taper). The welding current will remain at the Final level for the amount of time entered in the Final Time field below. The Final CURR value is limited by the Process maximum and minimum limits set in Configuration/Calibration as in the above examples for Initial and Weld CURR.

Downslope

2. Enter a Downslope Time in seconds.

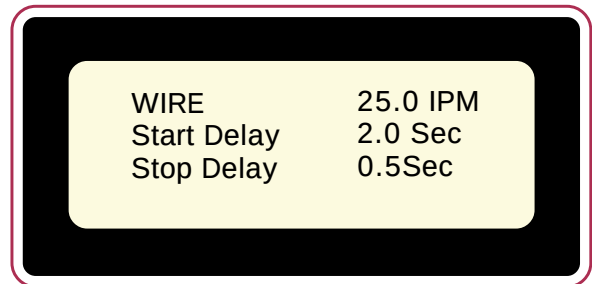
This time will determine the welding current downslope rate from the end of Taper CURR (or from the end of Weld CURR if no Taper) to the Final Current level.

Final Time

3. Enter a Final Time in Seconds.

After weld current downslope, the welding current will remain at the Final CURR value for as long as the time entered in the Final Time field.

K. Wire Feed



WIRE	25.0 IPM
Start Delay	2.0 Sec
Stop Delay	0.5Sec

Figure 4-30 Wire Feed Screen

Wire

1. Enter a Filler Wire Speed value in Inches Per Minute (IPM) or Centimeters Per Minute(CPM) for metric process.

The Filler Wire Speed value is limited by the process maximum and minimum limits set in Configuration/Calibration as in the above examples for Initial and Weld Currents.

Start Delay

2. Enter a Filler Wire Start Delay time in Seconds. The start delay range is from 0.0 to 99.9 seconds.

The Filler Wire Start Delay starts timing at the beginning of the ARC ON signal. When the start delay times out, the filler wire will start feeding.

In the weld program example (Fig 4-30), the wire Start Delay is 2.0 seconds. The wire Start Delay should be long enough to ensure that the welding current is high enough to properly melt the wire before the wire is introduced into the weld puddle. Normally, the wire should reach the weld puddle just before the end of the welding current upslope.

Stop Delay

3. Enter a Filler Wire Stop Delay time in Seconds. The Stop Delay range is from 0.0 to 99.9 seconds.

The Filler Wire Stop Delay starts timing at the beginning of Downslope. As the Stop Delay is timing, wire will continue, when the Stop Delay times out, the filler wire will stop.

The filler wire Stop Delay should be set so that the filler wire stops and retracts while the welding current is still high enough to melt the wire. If the wire is allowed to continue after the welding current has decayed to a point where the wire is no longer molten going into the weld puddle, the wire will ball up and may stick in the welding puddle. Once the wire sticks, damage could occur to the torch if weld travel device continues.

4.07 Copying a Weld Program

This allows for a duplicate copy of an existing program to be made as a new program or to overwrite an existing program. The copied program then can be modified to new parameter settings without having to enter all program parameter details.

1. Select option 3, Create/Modify from the Weld Sequence Menu.
2. Press 2 to Copy Program.

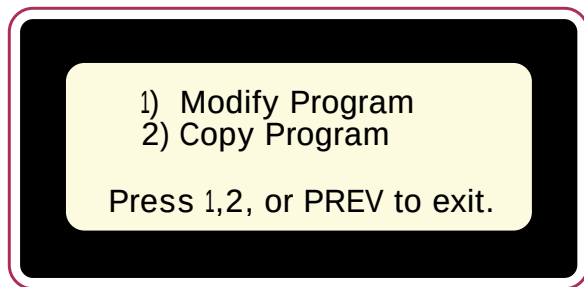


Figure 4-31 Modify Option

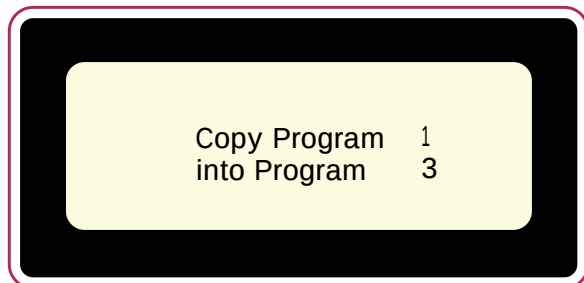


Figure 4-32 Selecting Program to Copy

3. Select program number of existing program (0-9) and press ENTER.
4. Select program number of new or existing to be overwritten (0-9) and press ENTER twice.

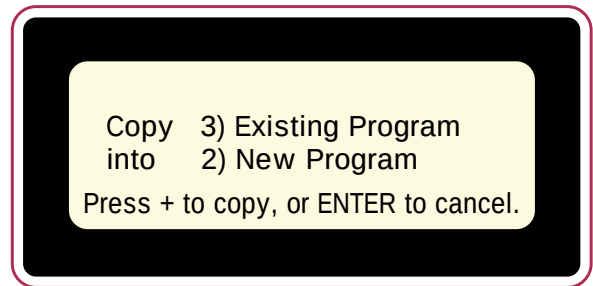


Figure 4-33 Copied Program

NOTE

Program name for new copy will be the same as the program name it was copied from. To change the name, go to the Modify Program and edit name after copy is saved.

5. Press (+) to copy (save copy) or Press ENTER to cancel.
6. Press 1 or 2 or PREV to exit.

4.08 Select/View Weld Sequence

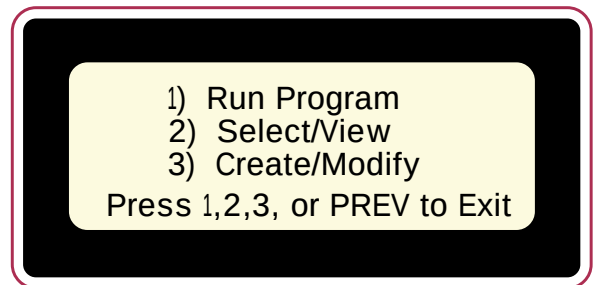


Figure 4-34 Weld Sequence Options Screen

1. Press 2 at the Weld Sequence Options Menu to Select/View.

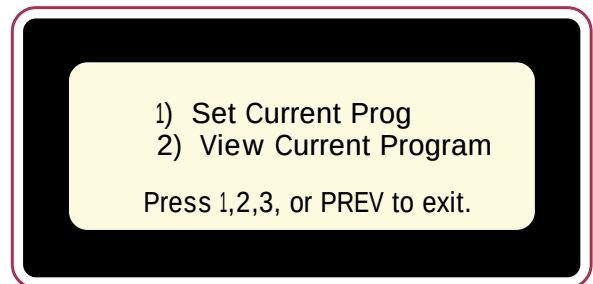


Figure 4-35 Set/View Current Program

A. Set Current Program

The Set Current Program is used to set a new default program. The default program is always the last program used.

1. Press 1 to Set Current Program.

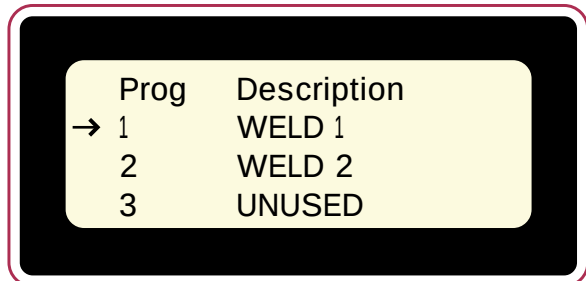


Figure 4-36 Set Program Description Screen

The cursor arrow will default to the last selected program. To select a new weld program, enter the numerical value of the desired program (0-9) or move the cursor using the UP or DOWN arrows until it is next to a program number that has not been previously used (UNUSED) and then press enter. (Note: Use "0" to select program #10.)

The Current program selected will now be displayed. Press PREV to return to Weld Sequence Menu.

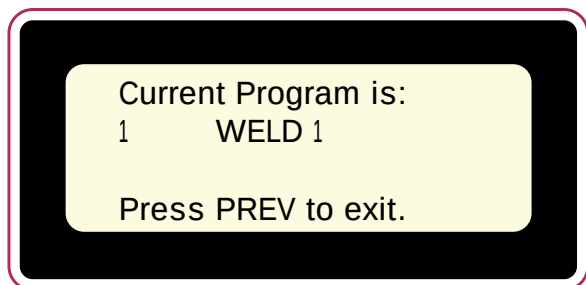


Figure 4-37 Current Program Display

B. View Current Program

The View Current Program option is used when you want to view the current program without being able to make changes to it.

1. Press 2 at the Weld Sequence Options Menu to View the current program.

NOTE

To use the View feature, a program must already have been created. To create a program, refer to Section 4.06.

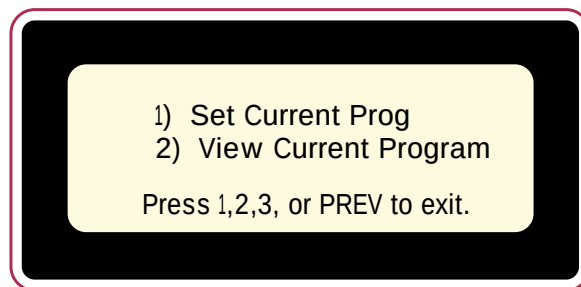


Figure 4-38 Set/View Current Program

The program can now be viewed by pressing Next and scrolling through the screens.

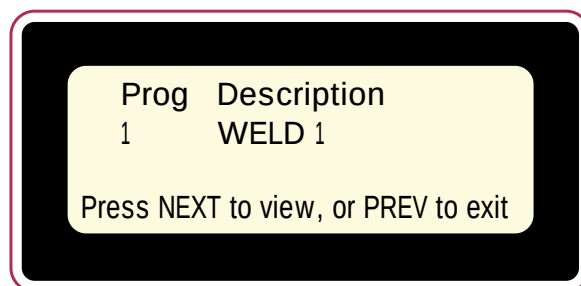


Figure 4-39 View Current Program Screen

4.09 Run Weld Sequence

A. General

The Run Weld Sequence option is used when you want to carry out a weld sequence **which has been previously programmed and recorded**. When this option is selected, the screen displays the number and description of the default program that will run. The default program is always the last program selected.

NOTE

You must establish a weld sequence program before you can use the Run Weld Sequence option. To create/Modify a weld sequence, see section 4.06. If you try to use the Run Weld Sequence option and no programs have been set up yet, the system will weld at minimum current only.

B. Run Program

If the weld sequence program displayed is not the one you wish to run, press the PREV key to return to the previous menu so you can make another selection using Section 4.08, Select/View a Weld Sequence.

NOTE

Refer to section 4.09 Select View Sequence for information on how to select a different sequence.

If the weld sequence program displayed is the one you wish to use, Press the START Switch to begin the weld.

Once the weld has started it will continue automatically from one stage to another according to the times which have been pre-programmed. The final weld sequence will be initiated either based upon the elapsed weld time (if weld time has been enabled) by an external signal such as may be provided by an end of travel limit switch. You can initiate this sequence yourself at any time during the weld by pressing the sequence Stop Button. This will immediately initiate downslope.

During the weld sequence, you may need to make some adjustment to one or several of the weld parameters, eg. increase/decrease current, wire feed speed. You can do this by first selecting the parameter to be changed and then increasing or decreasing it by moving the cursor to CURR or WIRE and then increase the parameter using the (+) key and decreasing the parameter using the (-) key.

NOTE

The maximum adjustment you can make is determined by the Trim Limit % of the set (programmed) value set in Section 4.04, System Configuration. Any adjustments made while welding are not saved in the program in use. If changes are to be saved, take note by viewing the parameters on screen while welding and then go to Create/Modify a program and make necessary changes to the program.

A weld sequence consists of 9 stages:

- Preweld
- Arc On
- Initial Weld
- Upslope Weld
- Main Weld
- Taper Weld
- Downslope Weld
- Final Weld
- Postweld

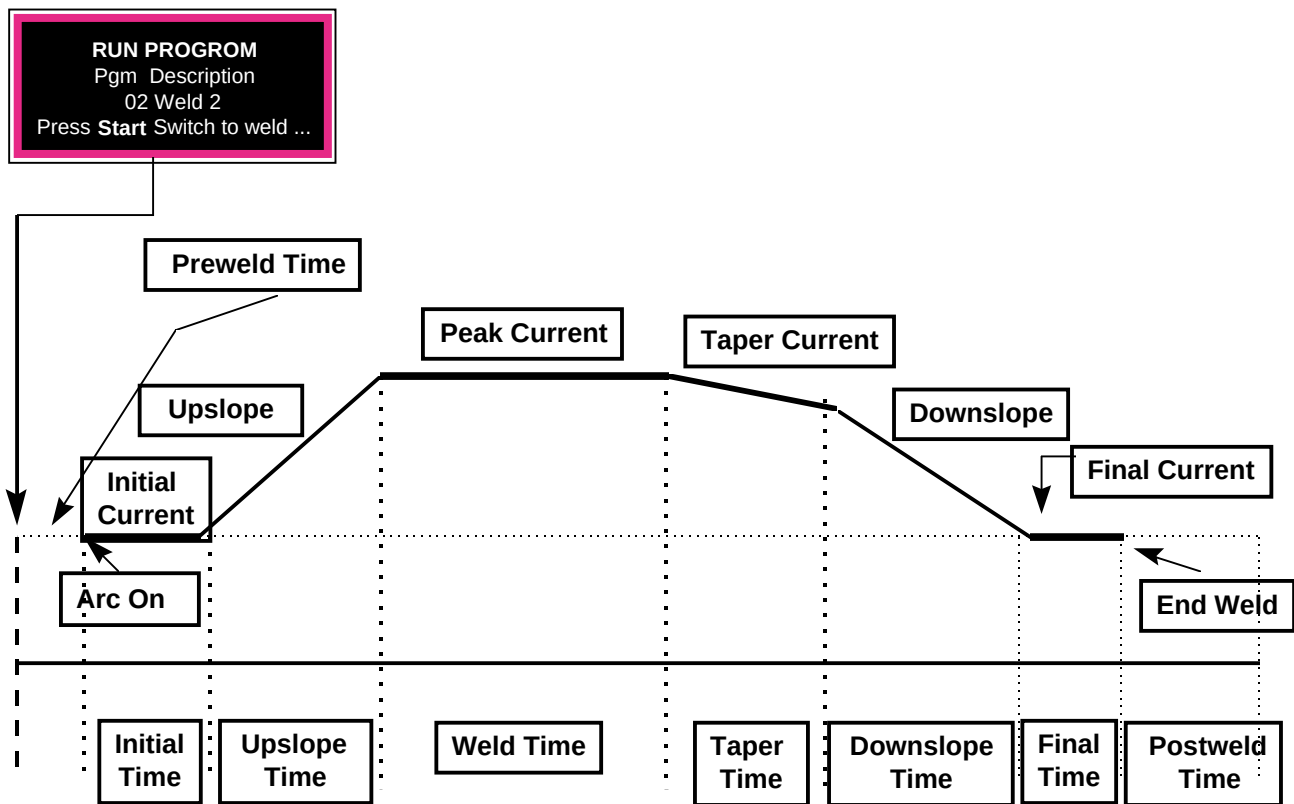


Figure 4-40 Weld Sequence Profile

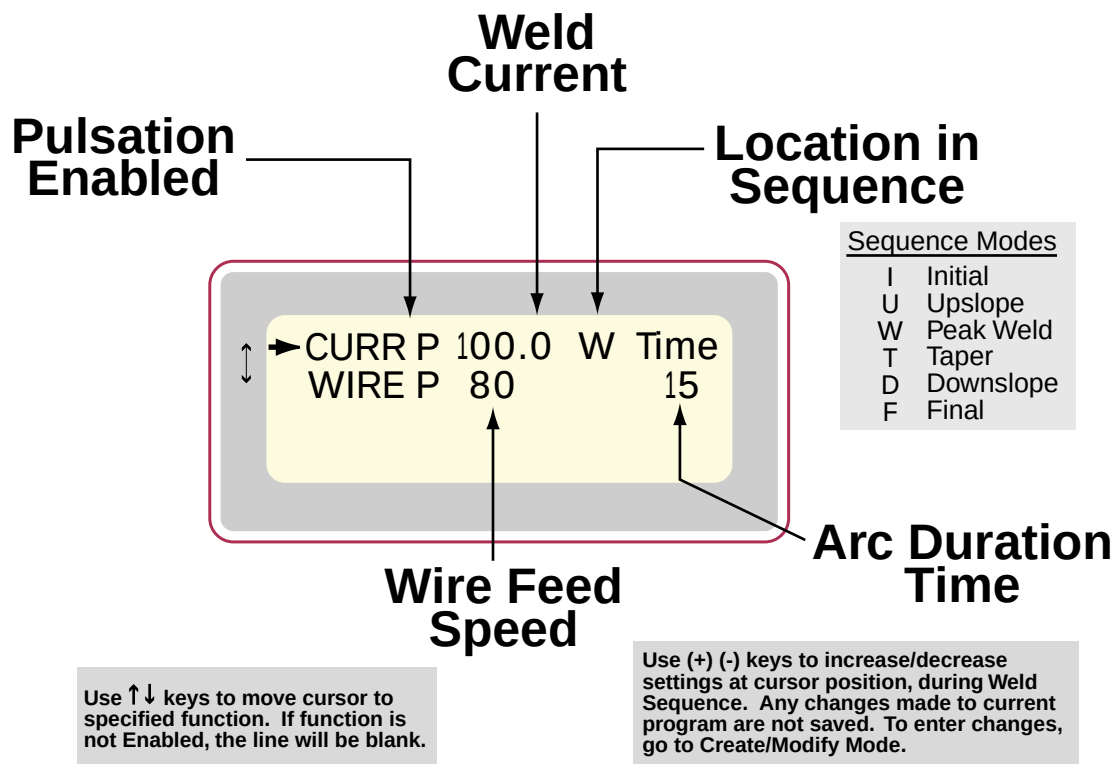


Figure 4-41 Weld Sequence Screen Display

4.10 Jog Channel Option

A. Introduction

Use this option to activate the feeding of the wire through the wire conduit to the wire guide at the torch in preparation for welding.

B. Wire

1. At the Main Options Menu, select option 2, Jog Channel, to display the Jog Channel Options.

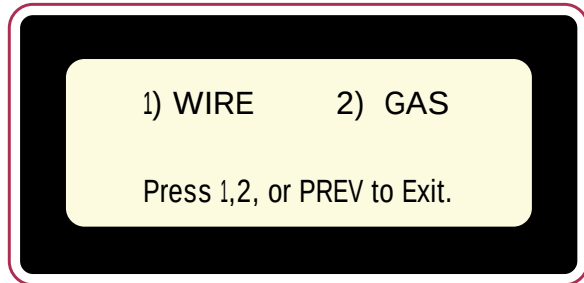


Figure 4-42 Jog Channel Options

2. Press 1 for WIRE.

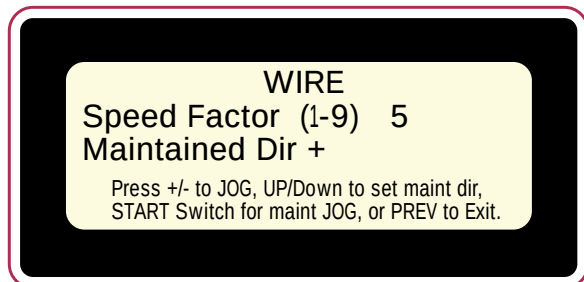


Figure 4-43 Wire

The speed factor for the JOG mode is 1-9. Press any numeric value from 1-9 to determine the JOG speed with 1 being the slowest and 9 being the fastest.

The UP/DOWN keys will set the direction of the motor with (+) being a FORWARD direction and (-) being a REVERSE direction.

Pressing the (+) key will JOG the wire FORWARD and pressing the (-) key will REVERSE the wire. The motor direction will only be activated while the keys are depressed.

The START Switch will start the JOG mode and maintain until the STOP Switch is pressed which will cease the maintained JOG. Press PREV to exit.

C. Gas Purge

1. At the Main Options Menu, select option 2, Jog Channel, to display the Jog Channel Options.

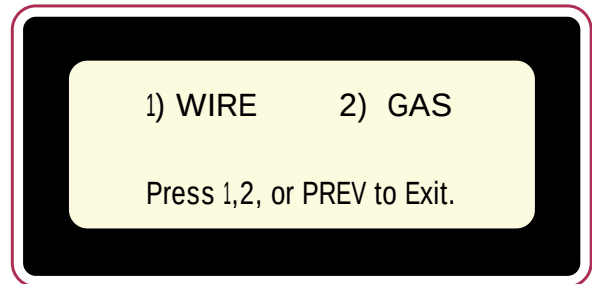


Figure 4-44 Jog Channel Options

2. Press 2 for GAS Purge.

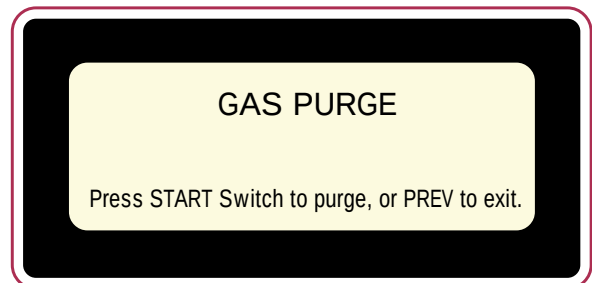


Figure 4-45 Gas Purge Screen

This function is only applicable with the SynerWeld 2100 Process Controller. There is a set of contacts available from Auxiliary Output. Activating the GAS Purge function can be used for accessories as gas backing purge, shield gas purge, or other accessory items.

4.11 Operating Precautions



WARNING

Read and understand the Warnings and Operating Precautions in Section 1 prior to operating this unit.

4.12 Preparation For Welding



WARNING

Make sure safety glasses with side shields are worn when handling, changing, or clipping wire off at the spool or at the end of the torch. Hold onto the wire coming off the spool with one hand before clipping. Serious eye injury can result due to the resilience of the wire which can quickly unravel, or a cut wire end which may shoot across the room.

1. Mount the spool of welding wire on the spool adapter so the wire will be pulled from the low side of the coil. (Wire spool should be mounted so that it moves in a counter clockwise direction.) Afterwards, replace the spool retaining ring. (Refer to Figure 4-46 for parts identification).
2. Adjust the friction brake on the wire spool by adjusting the screw in the center of the spool. If adjusted properly, the spool will feed smoothly and will not coast or continue to spin when feeding stops.
3. Debur end of wire, then insert it into the inlet guide, through the feed rolls and the outlet guide.
4. Turn the power switch to the ON position and feed the wire into the conduit by using the Jog Channel or using the (+) key in Run Program mode. Continue to feed the wire through the conduit and the wire guide tip until a desired amount extends beyond the tip.
5. Feed wire through to gun tip using the Tog Channel or using the (+) key in Run Program mode.
6. Using the Jog Forward/Reverse, inch the wire forward a little. Trim the wire if there is a ball on the end of the wire.
7. When the wire is inched forward, this is a good time to verify the wire's position. Adjust if necessary.
8. Retract wire to desired starting position using the Jog Reverse function.
9. Check wire and wire spool briefly. Verify there is enough wire for the next weld and that the wire is not wrapped around the spool holder.
10. Check wire feed speed setting, the start delay setting and the stop retract setting. These settings are critical to achieve desired weld.
11. At this point the unit is ready to feed wire. If the starting and stopping of the wire is controlled remotely, leave switch in STOP position. When a start signal is received, the control will go through the start delay. Once this delay has timed out, the unit will proceed to feed wire at the rate set on the dial.



WARNING

When the control cable is connected to power source or interface box and the power is on, and gun trigger is depressed, the welding wire becomes electrically hot, and the wire feed rolls are activated.

When the remote signal quits, the unit stops feeding wire immediately. The unit then proceeds to enter the wire retract time, pulling the wire out of the weld zone. This action prevents the wire from sticking in the weld puddle at the end of the weld.

NOTE

If the retract time is set too long, the wire could retract up into the wire tip. If this happens, the wire could, on occasion, get stuck on the tip on the next weld.

8. If the unit is used manually, the operator will switch the Stop/Start to the Start position when ready to feed the wire. The start delay will NOT be activated when using this method. Wire will feed immediately once in the run position.

4.13 Operating Sequence

The following sequence is suggested:

1. Turn on power to unit. The START/STOP Switch should be in the STOP position.

When wire is no longer required, the operator switches the START/STOP Switch to the stop position. The unit will stop feeding the wire immediately and go into the wire retract procedure.

4.14 Wire Feed Attachment

Several Adjustments are provided on the Wire Feed Attachment in order to permit the exact position of the wire as it enters the puddle.

- a. Lateral adjustment of 1/4" (1/8" adjustment of tip each side of weld seam). (6.4 mm total adjustment, 3.2 mm on each side.)
- b. Vertical adjustment of 1/4" (6.4 mm) tip to work.
- c. Course adjustment of guide tip angle, by loosening screw and setting in approximate position.

The wire position should be checked at the beginning of the weld.

Jog the wire forward through the control and make required adjustments on the positioner. Wire typically enters the weld puddle at the leading edge of the puddle. The wire should contact the work piece about 0.04" (1 mm) in front of the weld puddle and slide under the center of the welding arc.

Check tension of drive roll spring. Too much pressure will deform wire and too little pressure will cause wire slippage.

4.15 Common Operating Faults

1. Deformed Wire

Check tension of drive roll spring. Too much pressure will deform wire.

2. Wire slippage

Check tension of drive roll spring. Too little pressure will cause wire to slip.

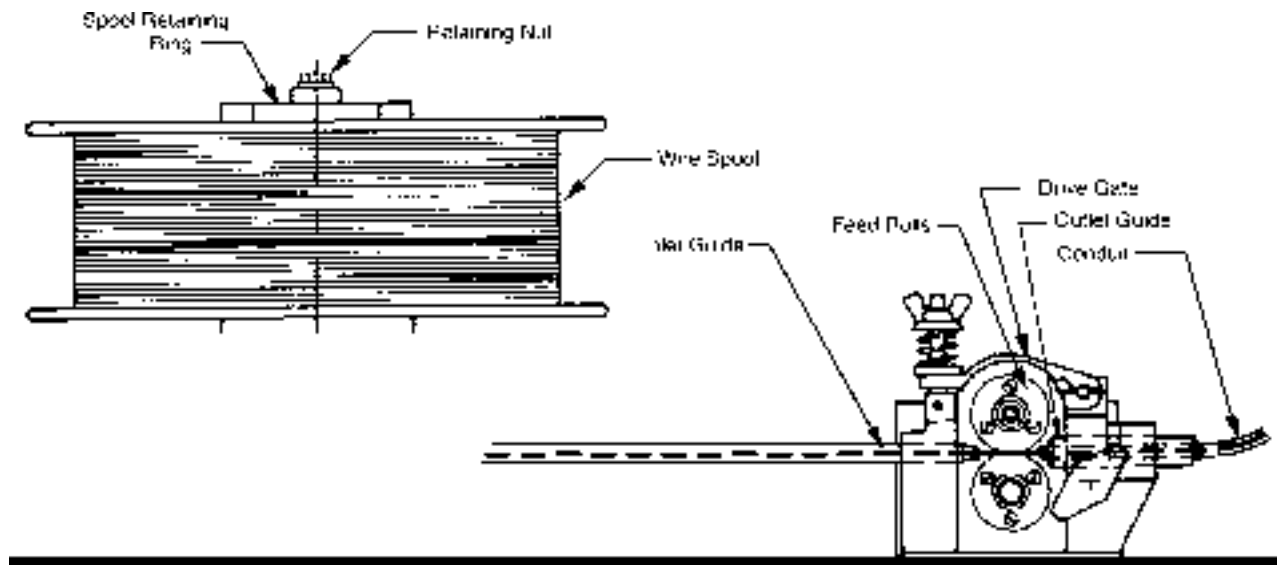


Figure 4-41 Cold Wire Feeder Parts Identification

SECTION 5: CUSTOMER/OPERATOR SERVICE

5.01 Introduction

This section describes first-echelon maintenance procedures performable by operating personnel. No other adjustments or repairs are to be attempted by other than proper trained personnel.

CAUTION

If this equipment does not operate properly, stop work immediately and investigate the cause of the malfunction. Maintenance work must be performed by an experienced person, and electrical work by a trained electrician. Do not permit untrained persons to inspect, clean, or repair this equipment. Use only recommended replacement parts.

5.02 General Maintenance



WARNING

Disconnect primary power to the system before opening the unit.

A. Wire Feeder

1. Routine Maintenance

Only routine maintenance is required to keep the wire feeder in top operating condition. It is important, however, that moving parts such as feed and pressure rolls, wire feed motor, etc., be kept clean and free of dust or dirt. The frequency of maintenance will depend on the usage and the operating environment.

2. Cleaning

CAUTION

Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

Cleaning is best accomplished by regularly blowing off the feed and pressure rolls, wire feed motor, and other parts with dry compressed air. This should be done once for every eight hours of operating time, more often if necessary.

The unit should also be wiped clean. If necessary, solvents that are recommended for cleaning electrical apparatus may be used.

3. Inspection of External Wiring

Inspect all external wiring on the unit. Look for any frayed wires or loose connections that should be corrected.

4. Inspection of Wire Feeder

As soft wire is fed, the drive rolls may pick up metal from the wire surface. Accumulation on the rolls may score the wire with resulting unwanted friction and improper feeding.

Inspect the rolls regularly and clean them with a fine-wire power brush. Avoid roughening, or removing the hardness of groove surfaces in grooved rolls. Any roughening may score the wire, just as the accumulation being removed may do.

SECTION 6: PARTS REPLACEMENT

6.01 Introduction

This section provides a list of SynerWeld 2100 parts that can easily be replaced by the user. It also provides a list of all options and accessories. For a complete list of all replaceable parts, refer to the Service Manual. For more information on torches, power supplies, xxxxx see the appropriate torch manual.



WARNING

Evidence of unauthorized repairs may void the factory warranty.

6.02 Returns

If a Thermal Arc® product must be returned for service, contact your Thermal Arc® distributor. Materials returned to Thermal Arc® without proper authorization will not be accepted.

6.03 Ordering Information

Order replacement parts by *catalog number* and complete *description* of the part or assembly, as listed in the description column of the Parts List. Also include the *model* and *serial number* of the machine as shown on the data plate located on the outside panel of the unit. Address all inquiries to your authorized Thermal Arc® distributor.

NOTE

For the most current information on catalog numbers & system configurations, refer to the sales literature catalog for each product.

6.04 Weld Process Controllers

A. SynerWeld™ 2100 Add-On Weld Processor Controller

3-2782 SynerWeld 2100 Weld Processor Controller for the Ultima-150 or PS-3000 Systems

B. 775 SynerWeld™ Add-On Weld Process Controller with Built-In Cold Wire Feeder

3-2780 SynerWeld 2100 Processor Controller w/MPC-21-ICW Integrated Cold Wire Feeder System for the Ultima-150 or PS-3000

C. 775 SynerWeld™ System

The 775 System includes an Ultima-150 unit, SynerWeld Microprocessor Controller and Integrated Cold Wire Feeder System, appropriate Torch with Wire Feed Attachment and a Torch Spare Parts Kit. Systems are ordered based on the torch configuration.

6.05 Torch Spare Parts Kits

A. 3A Manual Torch (w/Wire Feeder) Spare Parts Kit

Catalog#	Qty	Description
5-3003		Spare Parts Kit Includes:
8-3040	1	Shield Cup
9-1789	5	0.046 Long Tip
9-1791	5	0.081 Long Tip
9-1811	5	0.093 Long Tip
8-2007	2	Electrode
9-1780	1	Collet
9-2240	1	Gas Distributor
9-1810	1	Gauge/Wrench Assembly
8-4025	1	Lubricant
8-3141	1	Tool Box
9-5955	1	0.052 Straight Wire Guide Tube
9-5957	1	0.090 Straight Wire Guide Tube

B. 3A Automated Torch Spare Parts Kit

Catalog#	Qty	Description
5-2985		Spare Parts Kit Includes:
8-3040	1	Shield Cup
9-1789	5	.046 Long Tip
9-1791	5	.081 Long Tip
9-1811	5	.093 Long Tip
8-2007	2	Electrode
9-1780	1	Collet
9-2240	1	Gas Distributor
9-1810	1	Gauge/Wrench Assembly
8-4025	1	Lubricant
8-3141	1	Tool Box

C. 4A Automated Torch Spare Parts Kit

Catalog#	Qty	Description
5-2986		Spare Parts Kit Includes:
8-4088	1	Shield Cup
9-1890	5	.046 Long Tip
9-1891	5	.081 Long Tip
9-1892	5	.093 Long Tip
9-1827	2	Electrode
8-4011	2	Liner
9-2240	1	Gas Distributor
9-1873	1	Gauge/Wrench Assembly
8-4025	1	Lubricant
8-3141	1	Tool Box

6.06 Options & Accessories**A. Quick Disconnect Torch Adapter Kit**

Catalog #	Description
5-2990	Quick Disconnect Adapter Kit

B. Gas Pressure Regulators

Catalog #	Description
9-2722	Argon
9-3053	Argon/Hydrogen

C. Cable Assemblies

Catalog #	Description
9-4919	10 ft. Remote Cable (SynerWeld to Power Supply)

D. Leads Packages with QD

See Torch Manual for lead packages

E. Wire Feed Guide Attachment Kit

Catalog #	Description
5-3002	Auto Torch

F. Other

Catalog #	Description
7-3315	575V Transformer Module

6.07 Processor Controller Replacement Parts

Item#	Qty	Description	Catalog#
1	1	Controller w/cover	3-2780
2	1	Processor PCB	600174
3	1	Channel PCB-CH-1	600177
4	1	Channel PCB-CH-2	600184
5	1	Push Button Start/Stop	600198
6	1	Rocker Switch On/Off	600199
7	1	Red Switch Cap	600200
8	1	Green Switch Cap	600201
9	1	Rocker Switch Cap	600202
10	1	Power Supply Controller	600203
11	1	Spool Adapter	870058
12	1	Resistor	600222
13	1	SCR Control	600225
14	1	Relay Board	600229
15	1	Motor CWF-10A	600236
16	1	Wire Drive Assembly	600237
17	1	Drive Rolls .035	600208

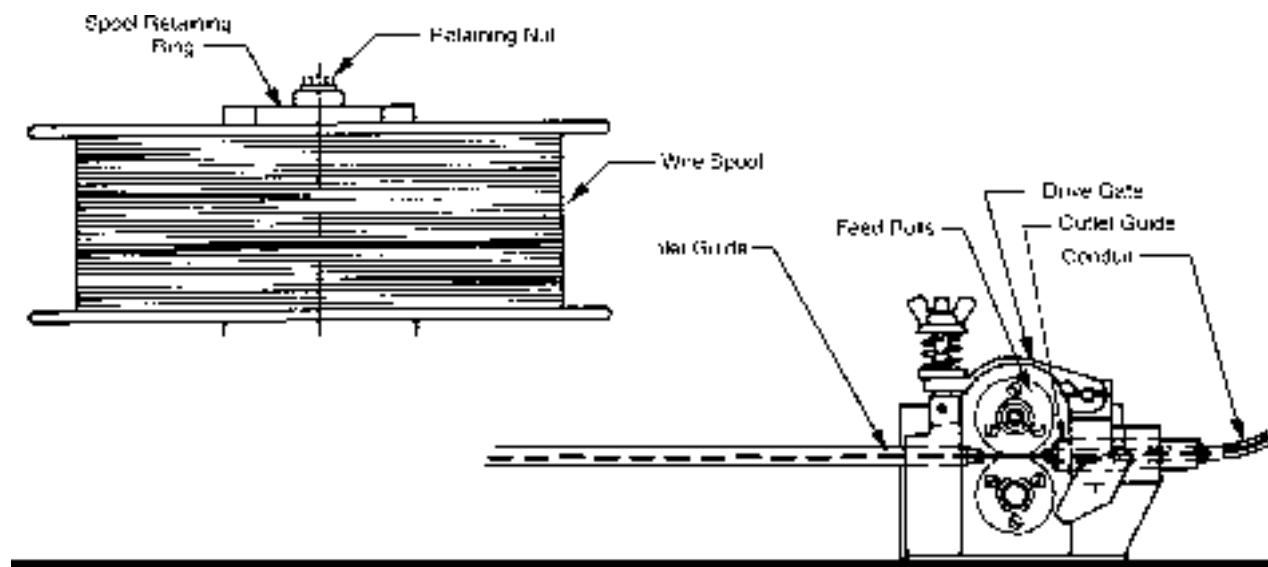


Figure 6-1 Wire Feed Replacement Parts (not all parts are shown)

6.08 Manual Torch Feed Replacement Parts

Item#	Qty	Description	Catalog#
1	1	Torch Handle Kit (includes *)	9-5990
	2	Handle Screw	
	1	Switch Handle, Right	
	1	Switch Handle, Left	
	1	Trigger Leaf Assembly	
	1	Molded Trigger	
	2	Handle Insert	
2	1	Wire Guide Attachment	----
3	1	Guide Set Screw	----
4	1	Conduit Set Screw	----
5	1	Spacer Bushing	----
6*	1	Wire Guide Attachment Screw	----
7	1	Wire Guide Tube (0.052" ID) - straight	9-5955
8	1	Strain Relief	----
9*	1	Torch Sequence Switch	----
10	1	Interrupt Switch Assy	
11	1	Trigger	----
12	1	Trigger Switch Mechanism	----
		Wire Conduit w/Inlet Guide Assy	
13	1	Conduit	9-5985
14	1	Inlet Guide Assy	9-5986
16	1	Cable for Trigger Sequence Switch	----
17	1	Handle Adapter	----
18	1	Torch Switch Harness Assy (QD to remote interface assy)	9-4915

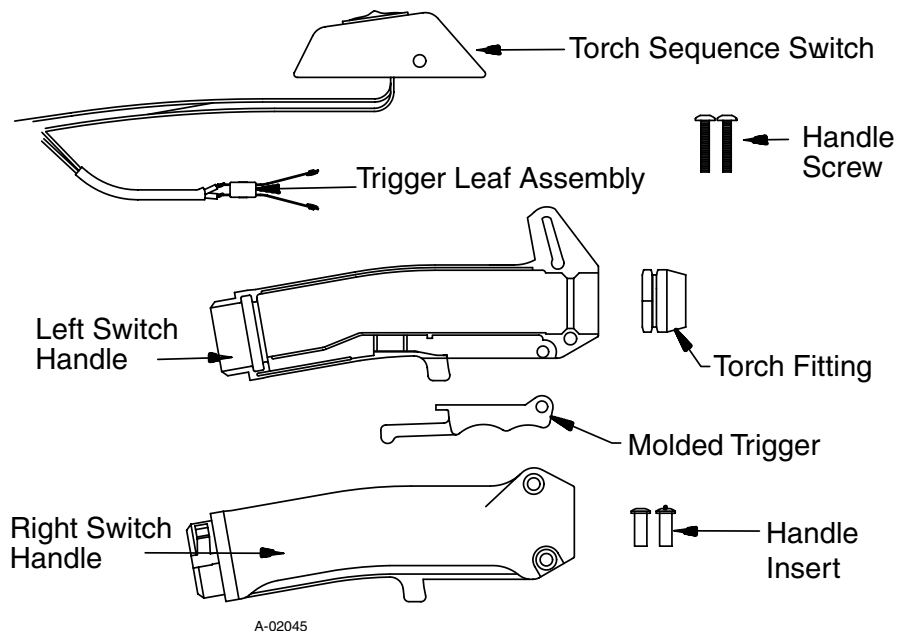


Figure 6-2 Manual Torch Parts

6.09 Replacement Torches

			Torch Configuration for use with Ultima-150						
Torch Rating	Cooling Requirements	Torch Leads Length	70 (Manual) (H)	180 offset (H)	180 offset (M)	180 inline (H)	180 inline (M)	Wire Feed Attachment	Spare Parts Kit
3A 100 Amps	6,000 BTU/hr (1513 K/Cal/hr 1/3 gpm @ 50 psi) (1.25 1 Lpm)	15 ft. (3.8m)	* 2-2140 with Wire Feed Attachment					*included 5-3002	5-3003 5-2985

NOTE: All torches specifically listed for operation with the Ultima 150 incorporate a Quick Disconnect Connector.

*Wire feed attachment for Manual Torch is included

(H) designates torch with molded handle

(M) designates torch with metal rack and pinion assembly

Figure 6-3 Replacement Torches Table

6.10 Replacement Torch Parts

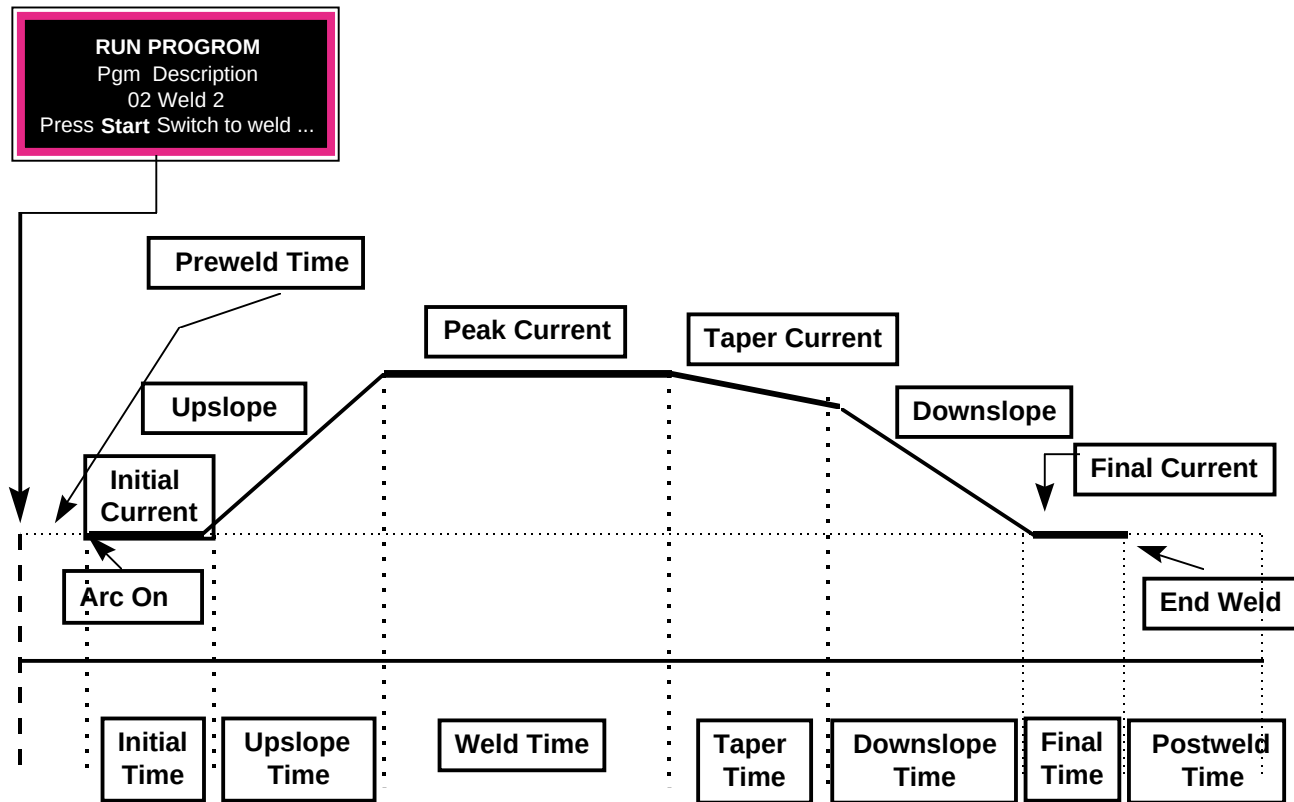
		3A Torch			4A Torch		
Item Number	Part	Part Description	Catalog Number	Qty In Spk	Part Description	Catalog Number	Qty In Spk
1	Torch Head	70 Deg	8-3030		70 Deg	8-4014	
		90 Deg	8-3031		90 Deg	8-4015	
		180 Deg offset	8-3032		180 Deg offset	8-4016	
		180 Deg inline			180 Deg inline	8-4054	
2	Shield Cup	w/gas lens	8-3040	1		8-4088	
3	Tip	(.031) 35A-lg	9-1788	5	(.062) 100A-lg	9-1890	5
		(.046) 50A-lg	9-1789		(.093) 125A-lg	9-1891	
		(.062) 75A-lg	9-1790		(.125) 150A-lg*	9-1892	5
		(.081) 100A-lg	9-1791	5			
		(.093) 130A-lg	9-1811	5			
4	Electrode	(.093) std	8-2007	2	(.187 std	9-1827	2
		(.093) ext.	9-1775		(.187) ext.	9-1834	
5	Liner	N/A			Liner-only	8-4011	1
6	Gas Distributor	Gas distributor	9-2240	1	Gas dist./insulator	9-2204	1
7	Gas Diffuser	Shield gas diffuser	8-3059		Shield gas push-on	8-4087	
8	Collet	Electrode collet	9-1780		Electrode collet	9-1876	
9	Back Cap	Std-electrode	9-1779		Std-electrode	8-4158	
		Ext.-electrode	9-1803	1	Ext.-electrode	9-1877	
N/S	Collar		N/A		Stainless collar	8-4024	
N/S	O-ring		N/A		O-ring- liner	8-0560	
N/S	O-ring		N/A		O-ring-internal	8-0528	
N/S	O-ring	O-ring-back cap	8-0527		O-ring-back cap	8-0530	
N/S	Gasket	Gasket-shield cup	8-3057		Gasket- shield cup	8-4069	
N/S	Gage/Wrench Assy.	Tip wrench/elect. setting	9-1810	1	Tip wrench/elect. setting	9-1873	1
N/S	Lubricant	Lubricant-o-ring	8-4025	1	Lubricant- o-ring	8-4025	1
N/S	Tool Box	Spare parts	8-3141		Spare parts	8-3141	
N/S	Spare Parts Kit	Manual Torch	5-3003**			N/A	
N/S	Spare Parts Kit	Auto Torch Spk	5-2985		Auto Torch Spk	5-2986	
N/S	Wire Guide Tube	.052 Straight	N/A			N/A	
N/S	Wire Guide Tube	.090 Straight	N/A	1		N/A	
N/S	Wire Conduit Assy.	15 ft .035-.045 conduit	N/A		15 ft .035-.045 conduit	N/A	

NOTES:

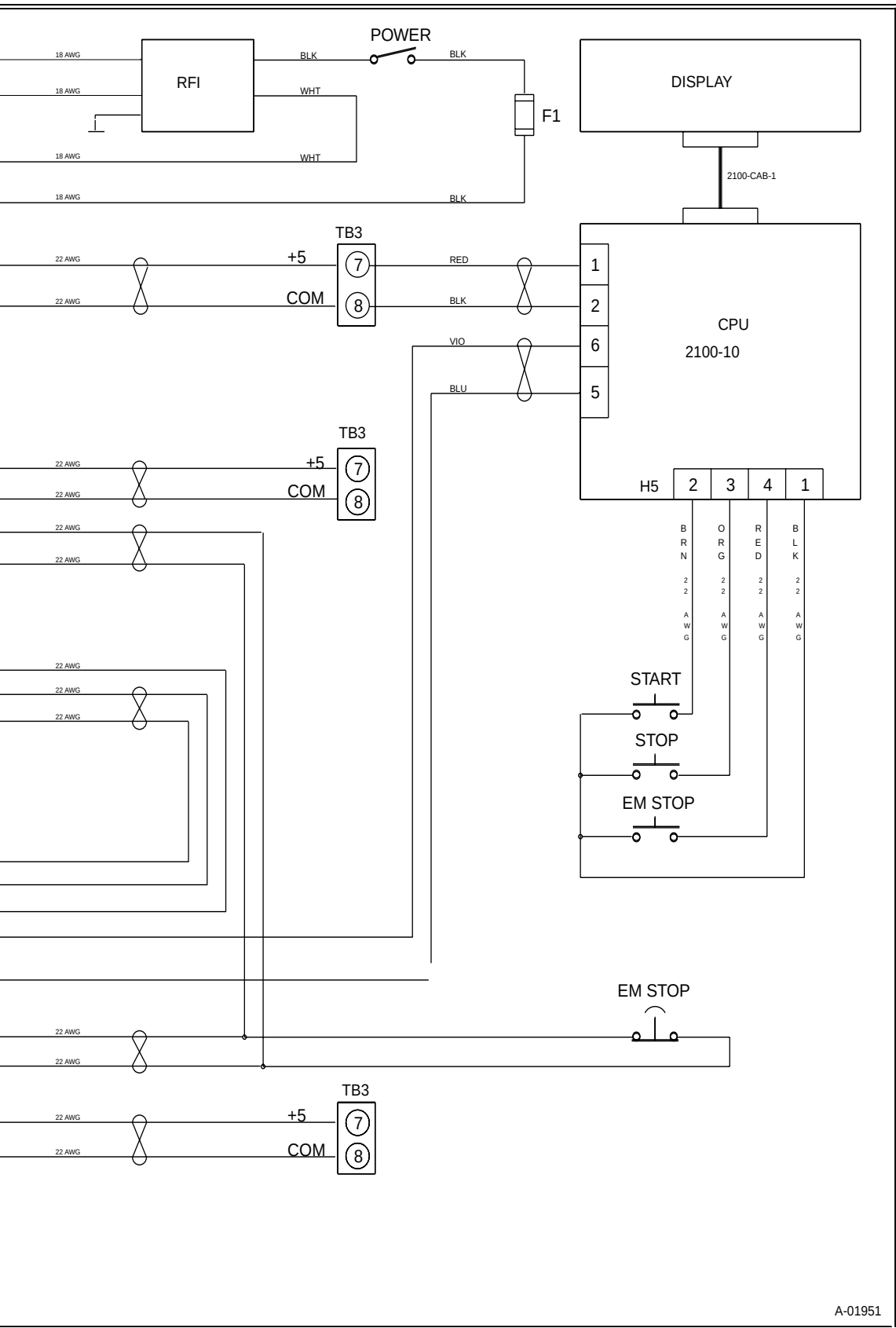
1. The use of extended electrode requires an extended back cap.
2. Tip ratings @ minimum electrode setback.
3. Tip maximum current rating not to exceed the maximum output of Ultima-150.
4. * Included in **Spare Parts Kit. Wire guide tubes can be slightly bent to meet requirements.

Figure 6-5 Replacement Torch Parts Table

APPENDIX I: WELD SEQUENCE PROFILE

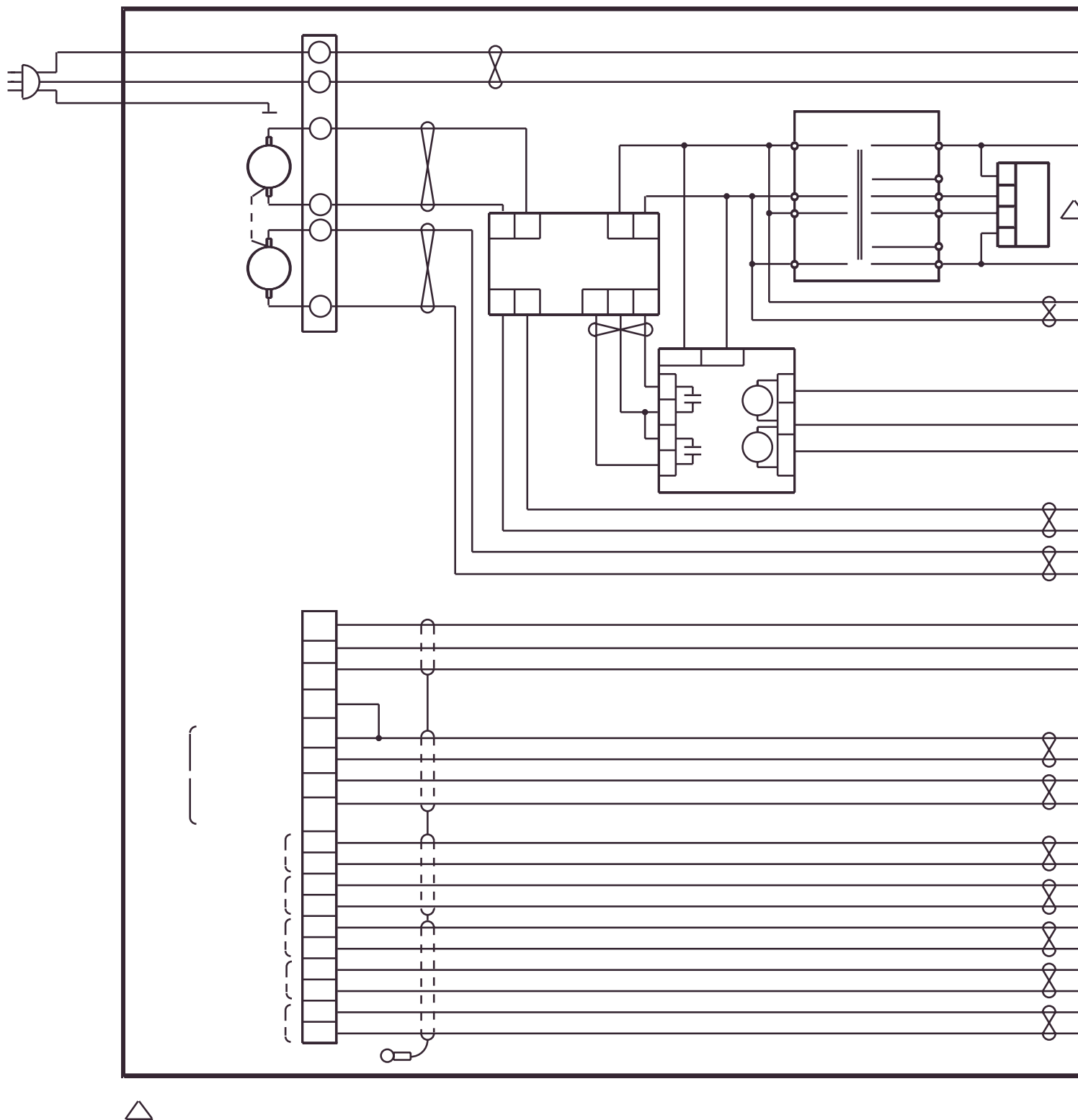


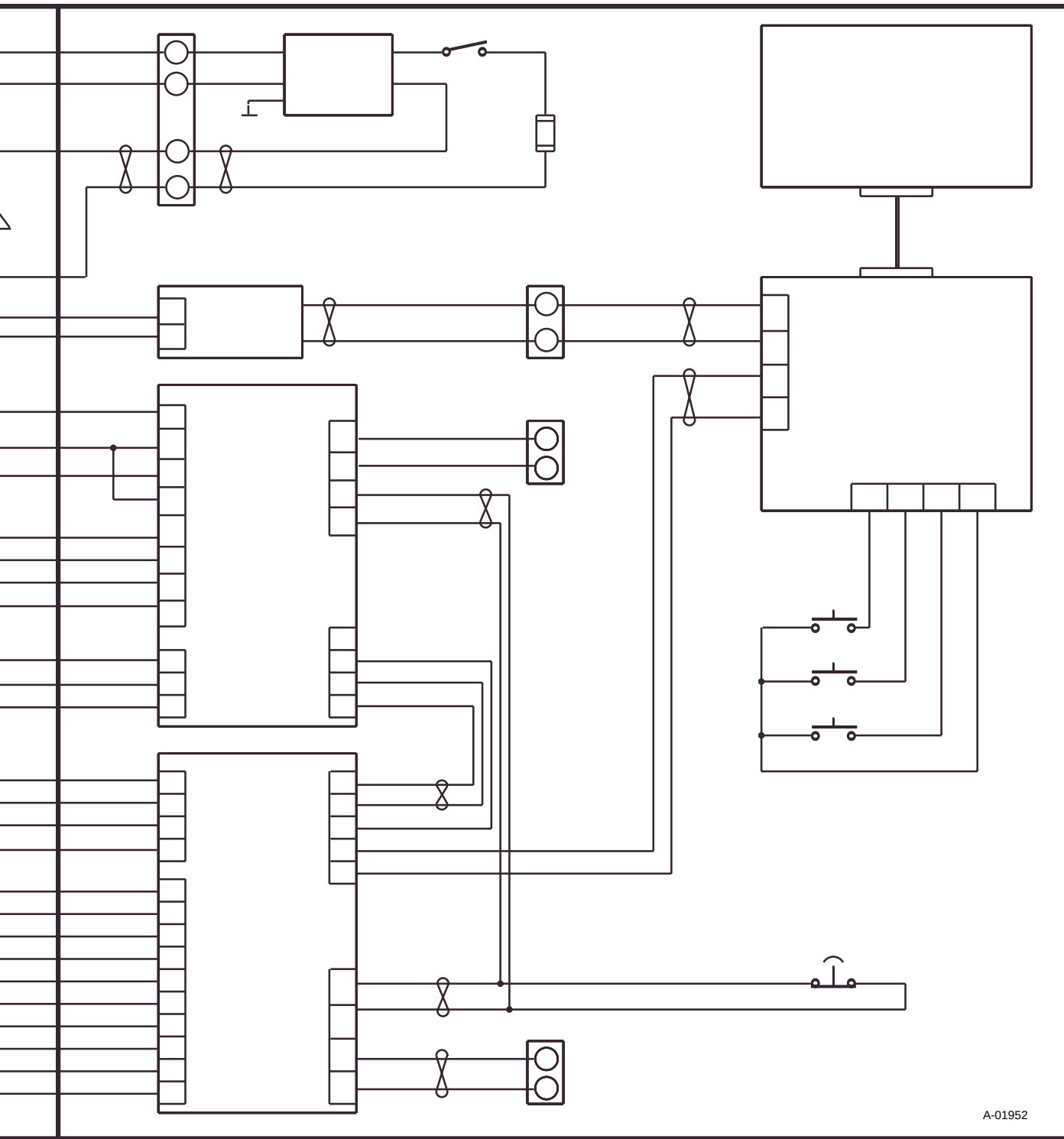
2100 PROCESSOR ONLY



A-01951

APPENDIX II: SCHEMATIC DIAGRAM - 2





A-01952

APPENDIX III: PROCESS CONTROLLER KEYPAD



All Modes: Saves entered information. Allows continuation to next numeric entry.
Activates a disabled function.



All Modes: Moves back to Previous Screen.



All Modes: Moves forward to Next Screen.



All Modes: Erases entered value.
Run Mode: Decreases Synergic Current/Wire values.
Modify Mode: Moves cursor to Left. Moves cursor Page Up.



Modify Mode: Moves cursor to Right. Moves cursor Page Down.
Run Mode: Increases Synergic Current/Wire values.



Run Mode: Increases output of selected parameter.
Jog Mode: Jogs wire Forward.



Run Mode: Decreases output of selected parameter.
Jog Mode: Jogs wire Reverse.



All Modes: Moves Cursor to Previous line.
Modify Mode: Starts @ A to B, C, D...
Jog Mode: Changes Jog direction to Forward



All Modes: Moves Cursor to Previous line.
Modify Mode: Starts @ A to B, C, D...
Jog Mode: Changes Jog direction to Forward



All Modes: Places Decimal Point entry.
Disables an Activated function.

APPENDIX IV: SYSTEM CONFIGURATION

CHANNEL CONTROLS

LOOP SENSITIVITY

CHAN %
CURR
WIRE

CLOSED LOOP DELAYS

CHAN %
CURR
WIRE

TRIM LIMITS

CHAN %
CURR
WIRE

SYNERGIC STEP

CHAN %
CURR
WIRE

CALIBRATION

CURR CALIBRATION

ACTUAL	INPUT	OUTPUT
150	4095	4095
5	136	0

WIRE CALIBRATION

ACTUAL	INPUT	OUTPUT
300	4000	4000
6	80	300

ULTIMA-150

CHANNEL CONTROLS

LOOP SENSITIVITY

CHAN %
CURR
WIRE

CLOSED LOOP DELAYS

CHAN %
CURR
WIRE

TRIM LIMITS

CHAN %
CURR
WIRE

SYNERGIC STEP

CHAN %
CURR
WIRE

CALIBRATION

CURR CALIBRATION

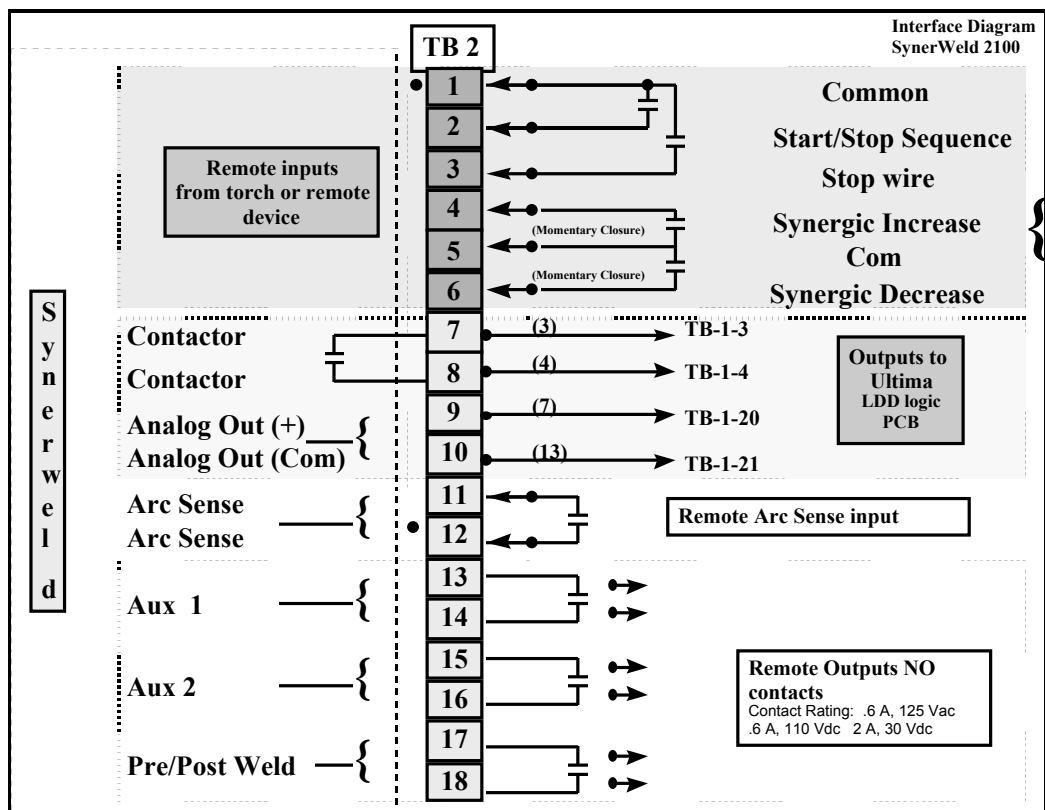
ACTUAL	INPUT	OUTPUT
365	4095	4095
5	136	0

WIRE CALIBRATION

ACTUAL	INPUT	OUTPUT
300	4000	4000
6	80	300

PS3000

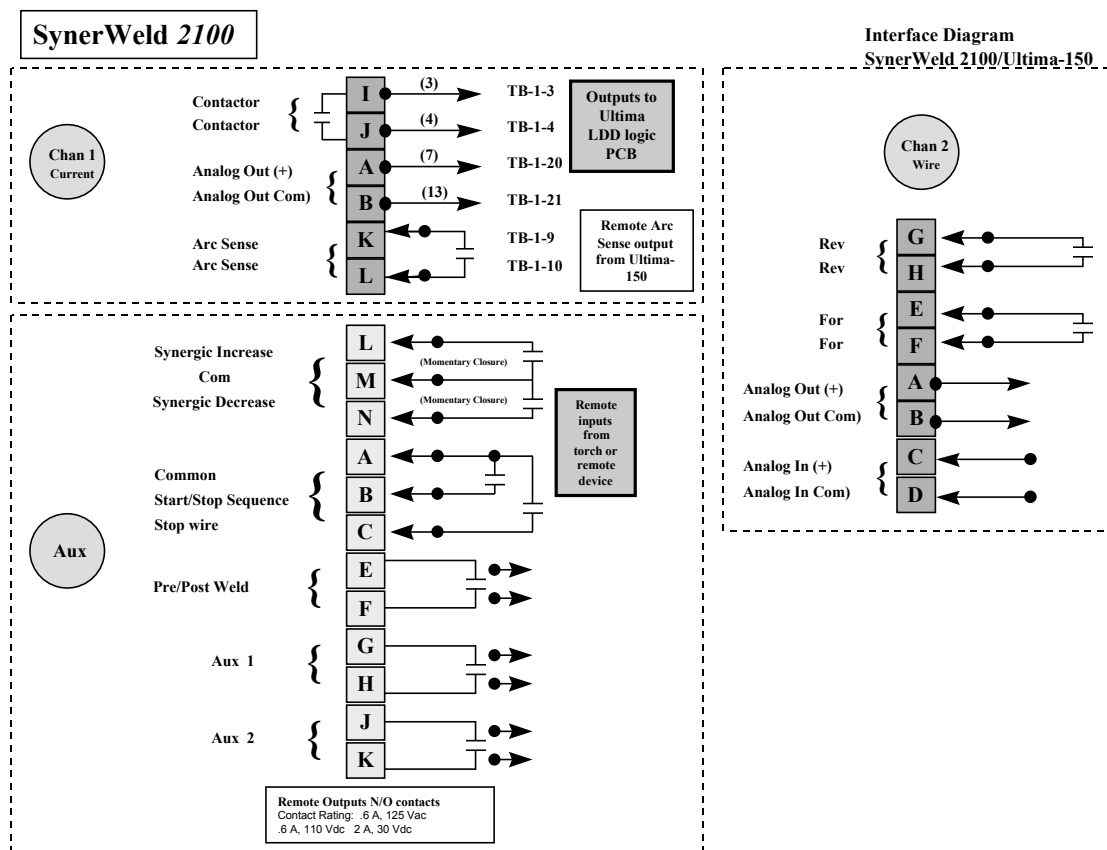
APPENDIX V: INTERFACE DIAGRAM SYNERWELD 2100 W/ WIRE FEEDER TO ULTIMA-150



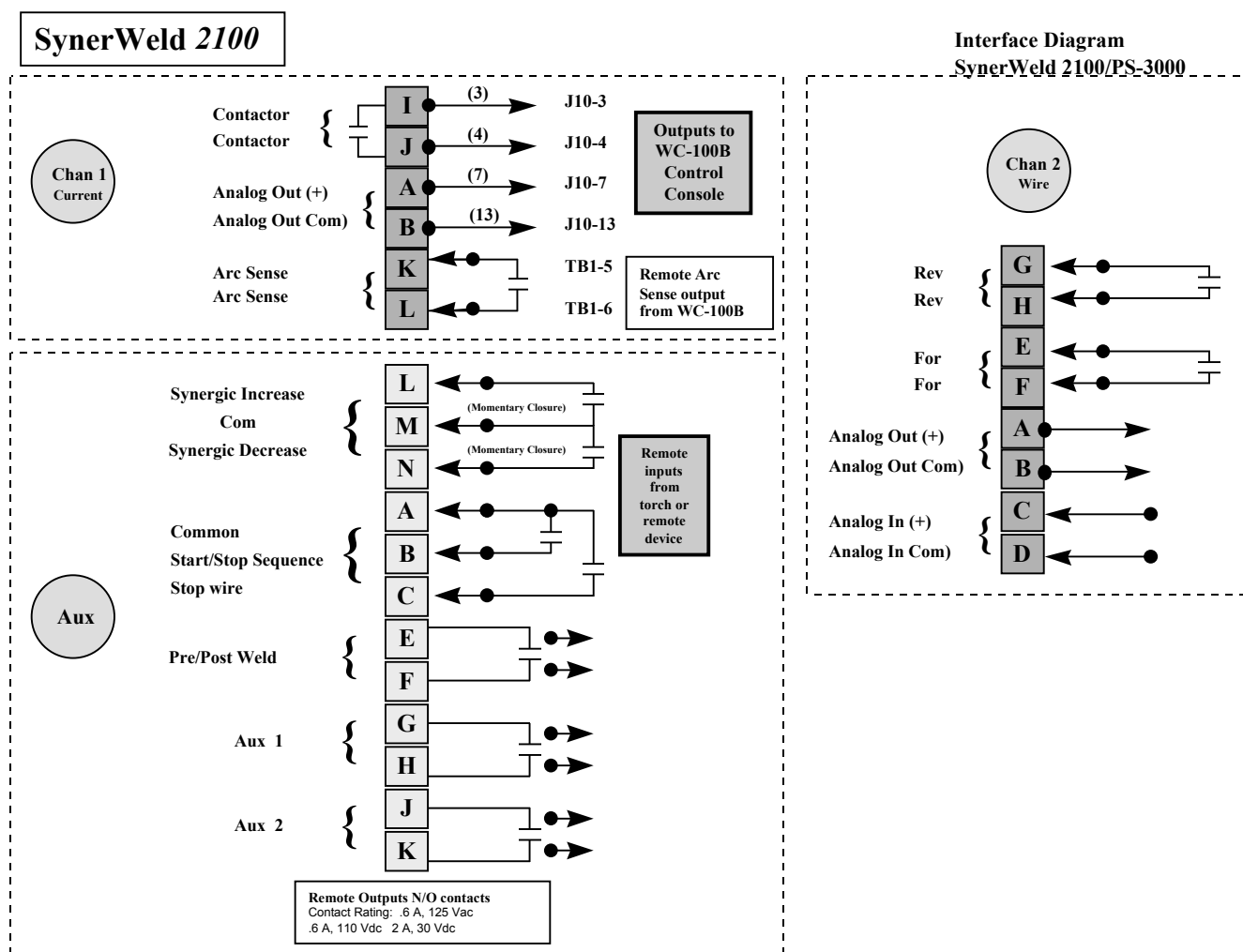
Interface Cable

TB2	WIRE
8	Black
7	Wht/Brn
9	Red
	Green
	Orange
10	Blue
1	Wht/Blk
2	Yellow
3	Brown
	Violet
12	Grey
11	White

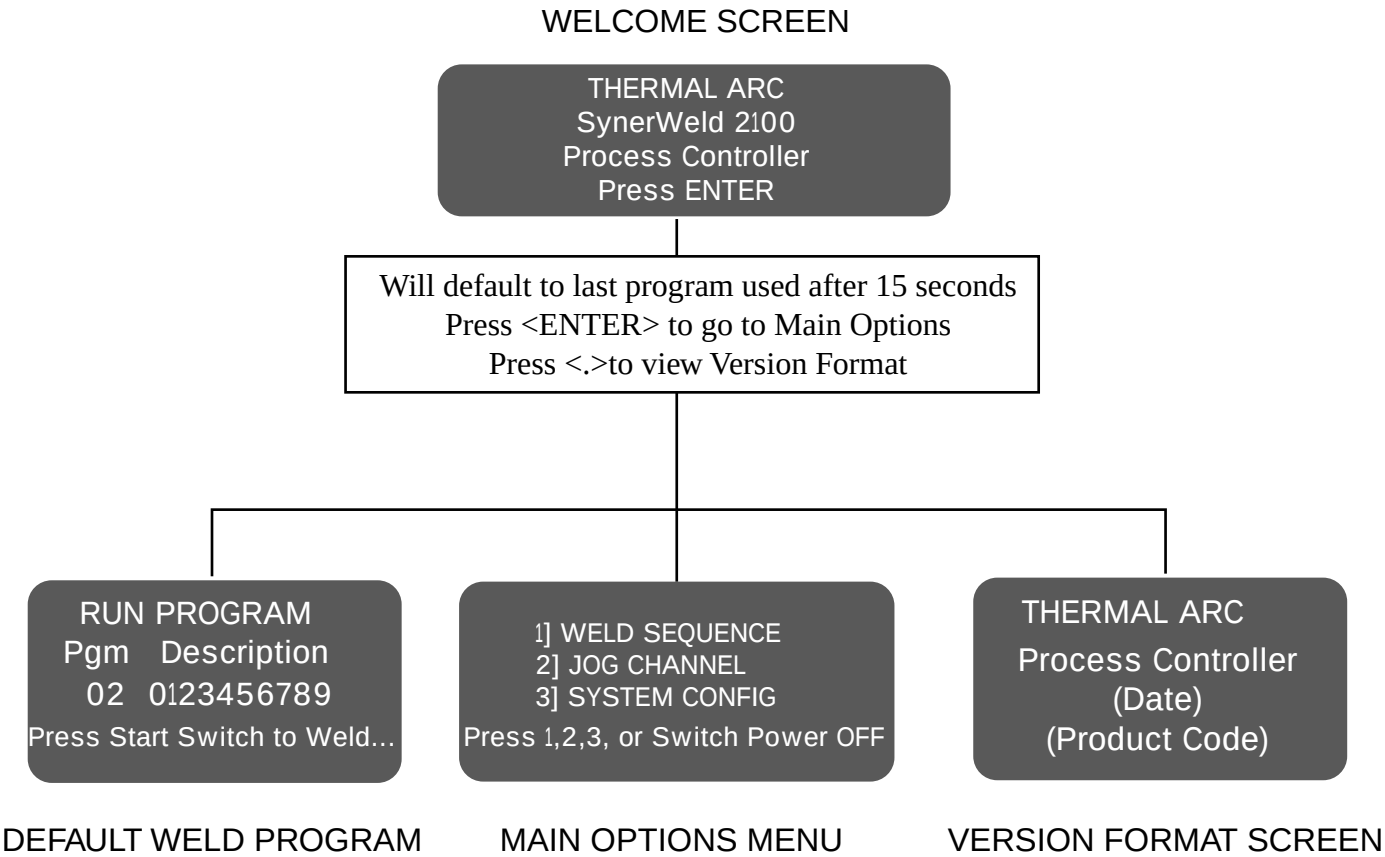
APPENDIX VI: INTERFACE DIAGRAM SYNERWELD 2100/ ULTIMA-150 (PROCESSOR ONLY)



APPENDIX VII: INTERFACE DIAGRAM SYNERWELD 2100/ PS-3000 (PROCESSOR ONLY)



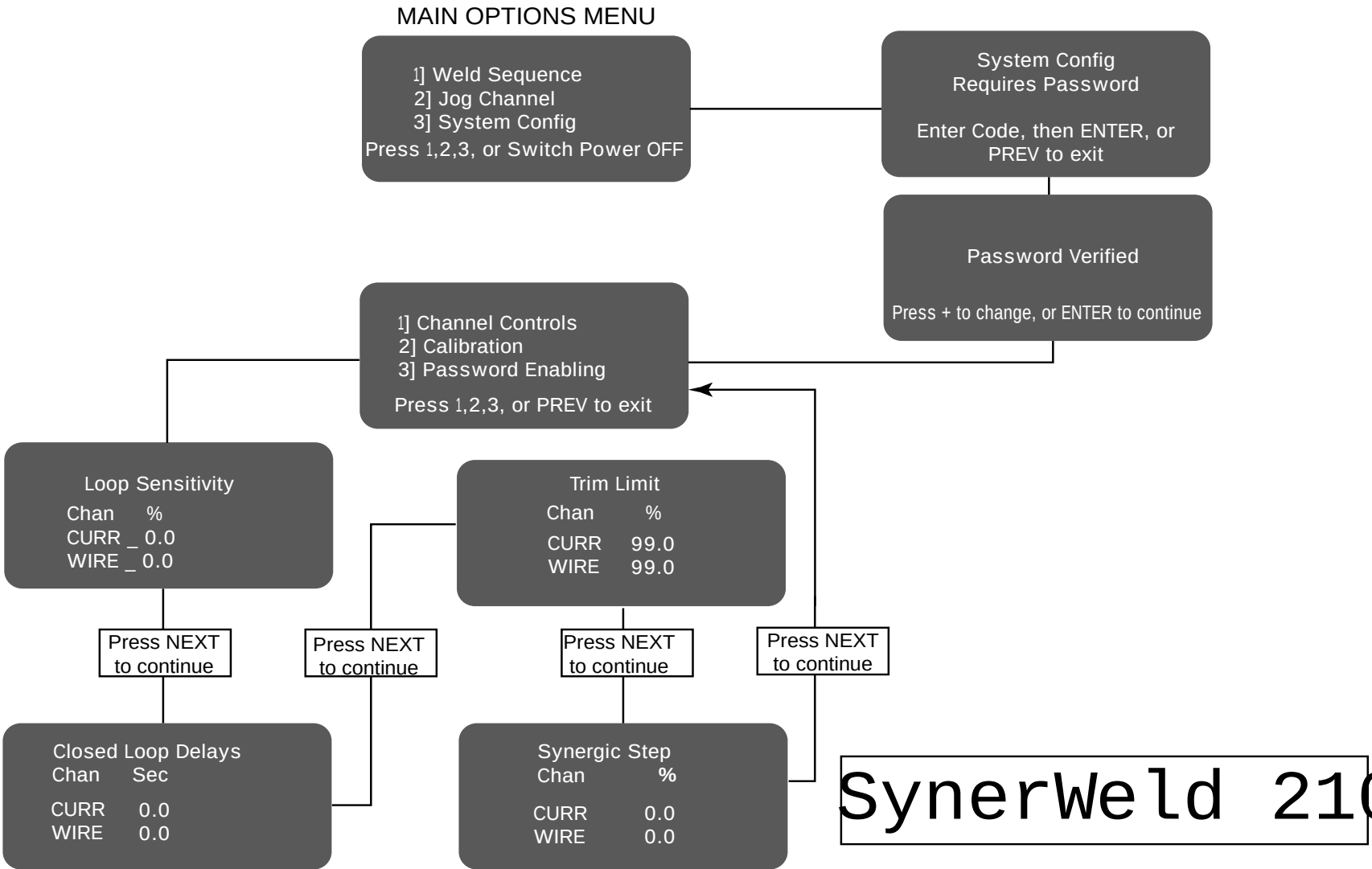
WELCOME SCREEN



SynerWeld 2100

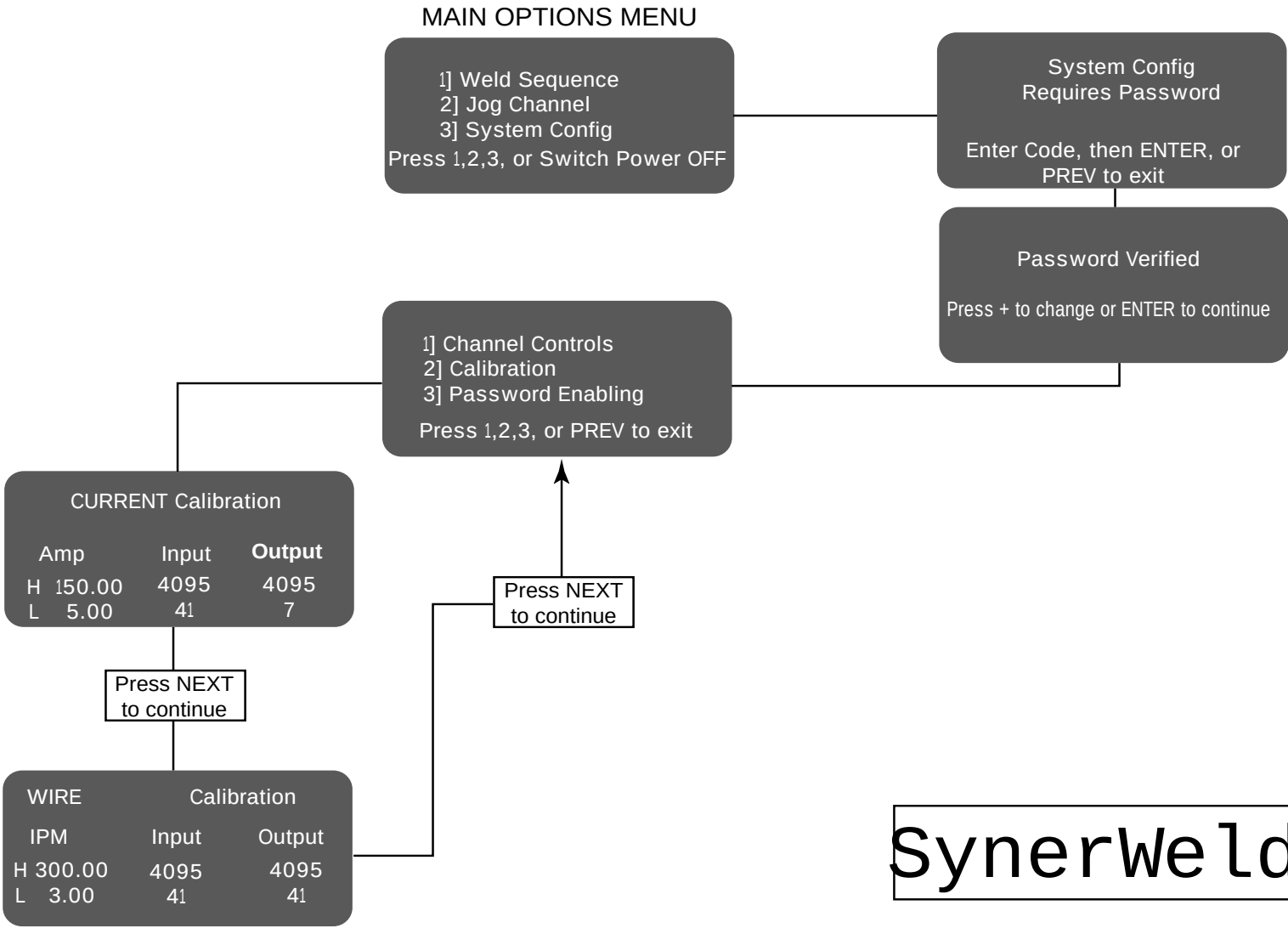
SYSTEM CONFIGURATION

Channel Controls



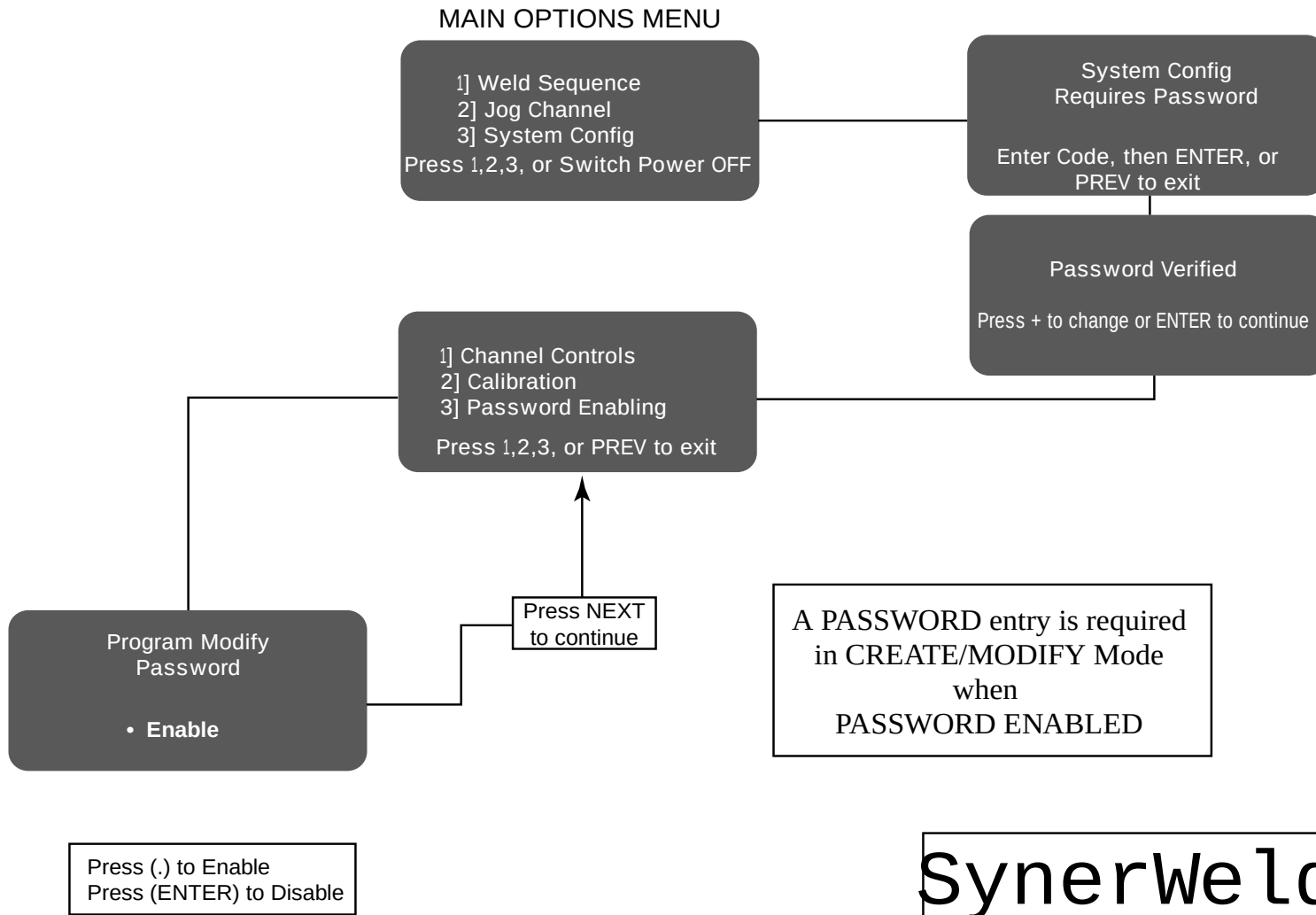
SYSTEM CONFIGURATION

Calibration



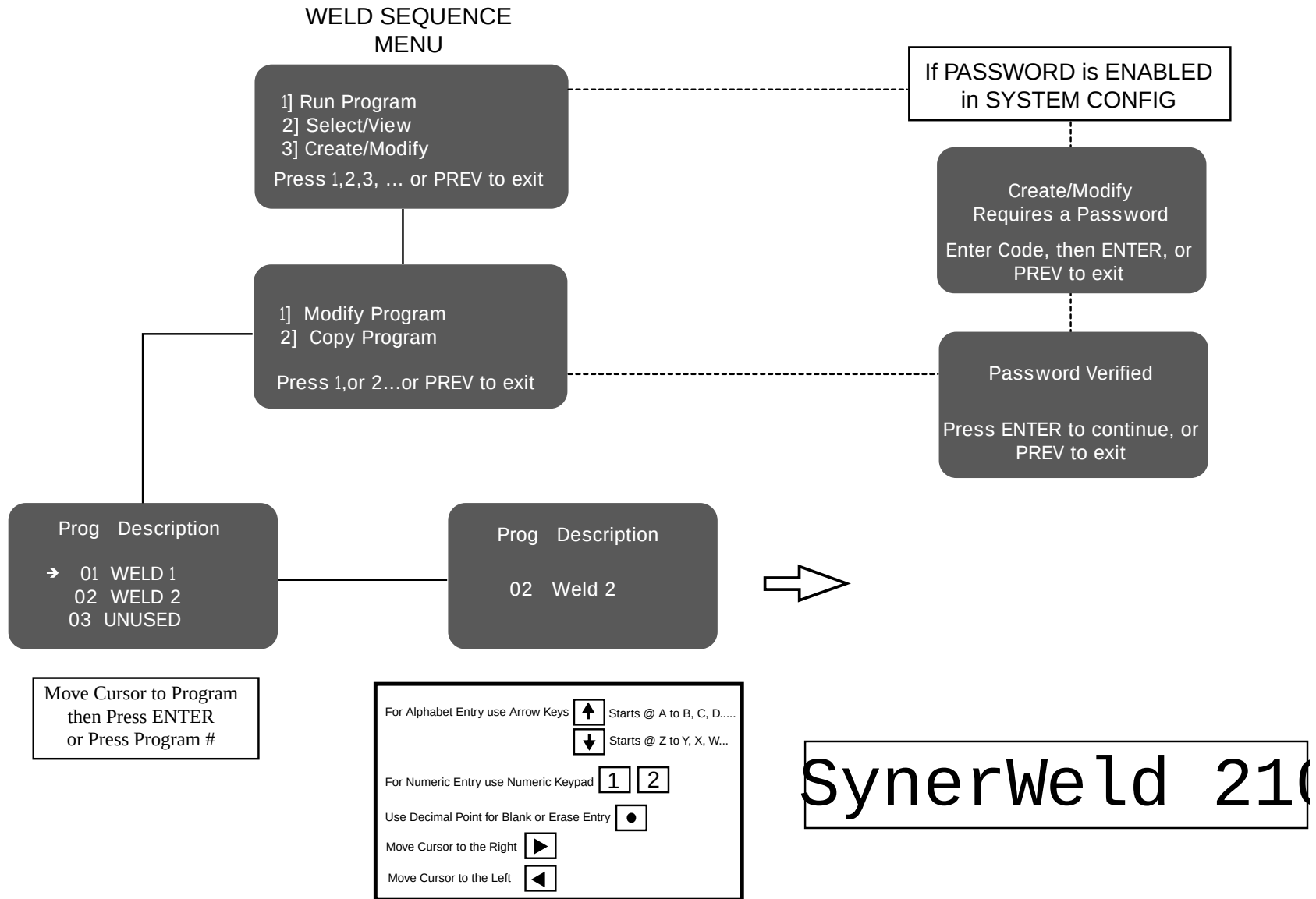
SYSTEM CONFIGURATION

Password

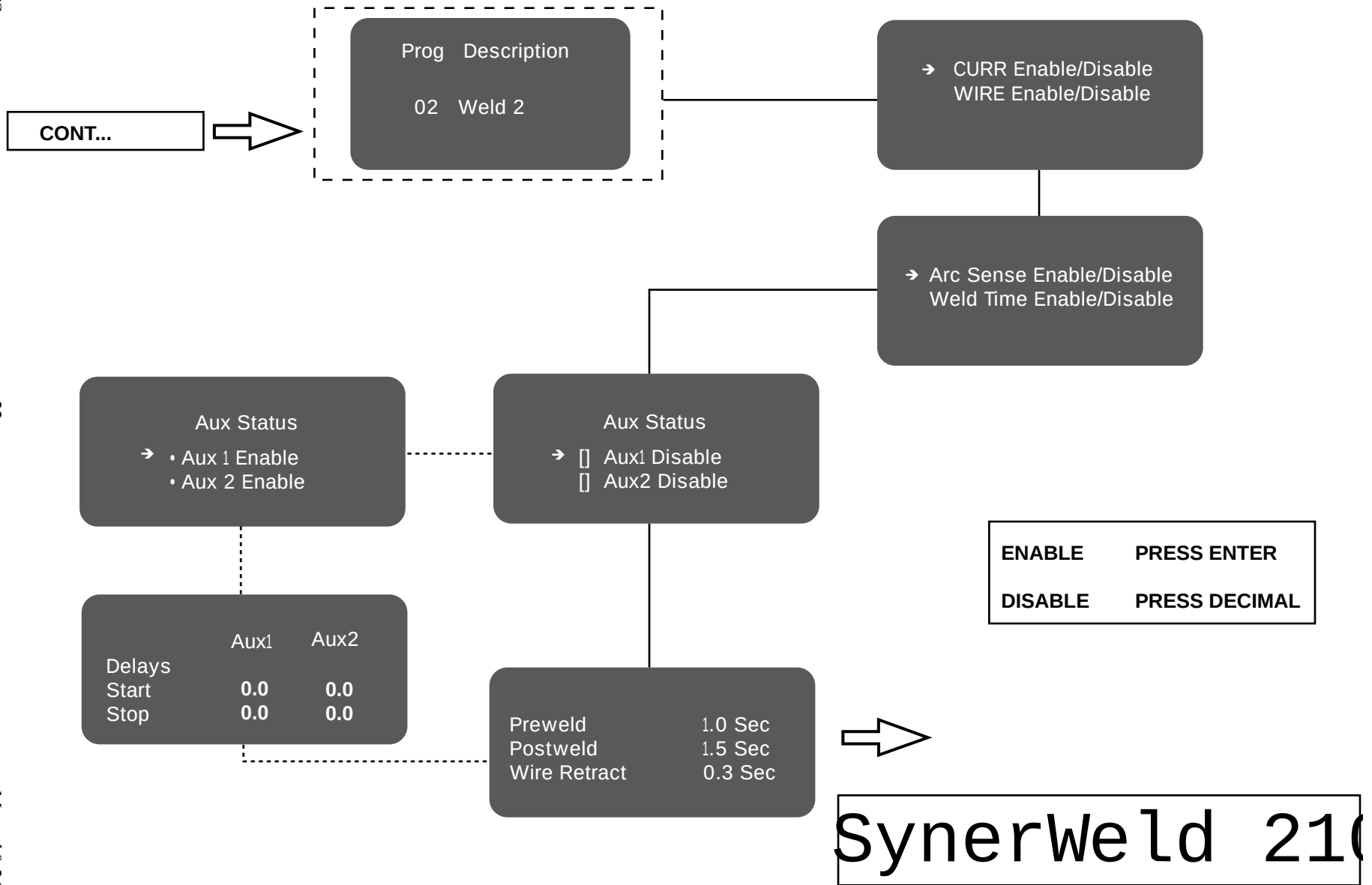


SynerWeld 210

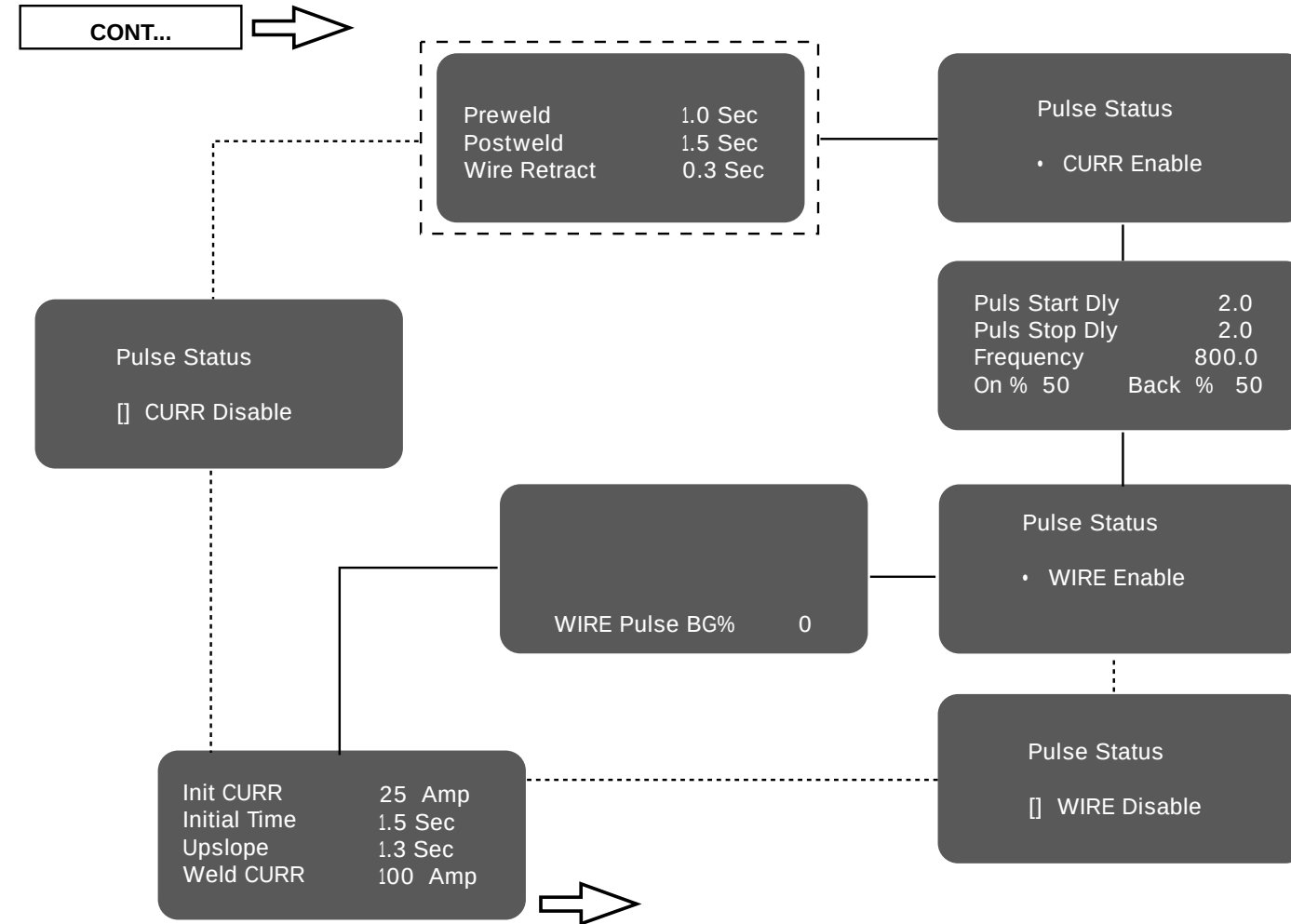
CREATE/MODIFY PROGRAM



CREATE/MODIFY PROGRAM



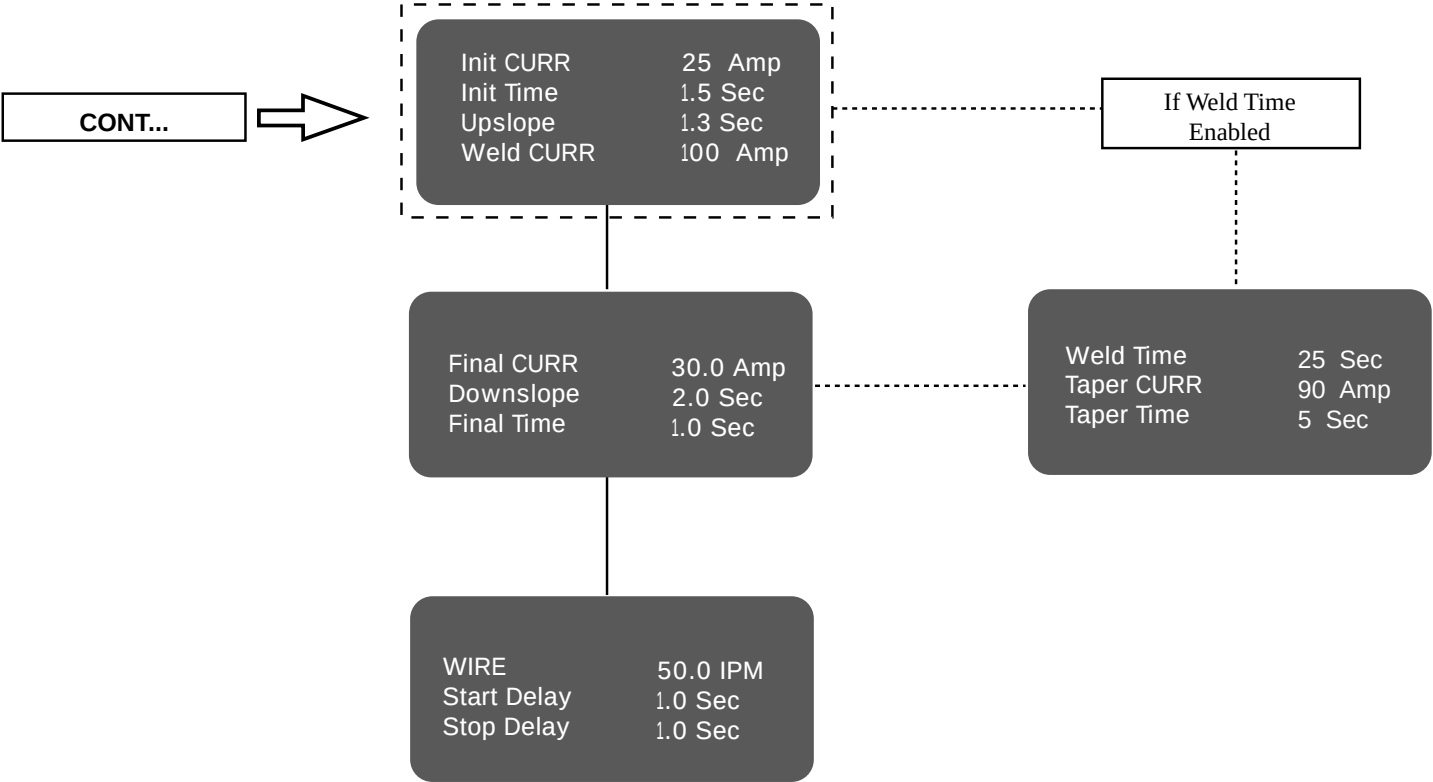
CREATE/MODIFY PROGRAM



ENABLE PRESS ENTER
DISABLE PRESS DECIMAL

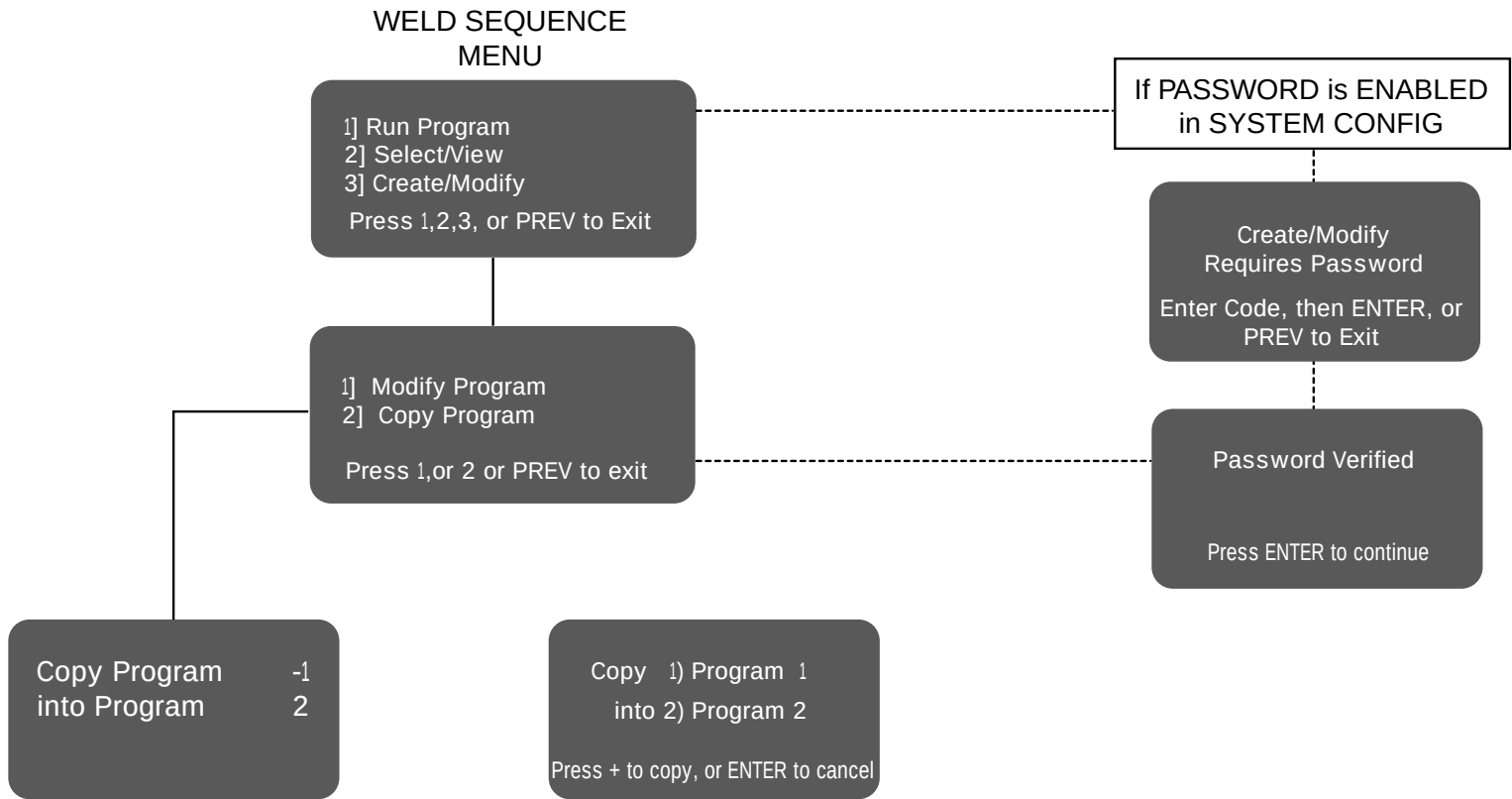
SynerWeld 210

CREATE/MODIFY PROGRAM



SynerWeld 210

COPY PROGRAM



For Alphabet Entry use Arrow Keys

↑ Starts @ A to B, C, D....

↓ Starts @ Z to Y, X, W...

For Numeric Entry use Numeric Keypad

1 2

Use Decimal Point for Blank or Erase Entry

•

Move Cursor to the Right

▶

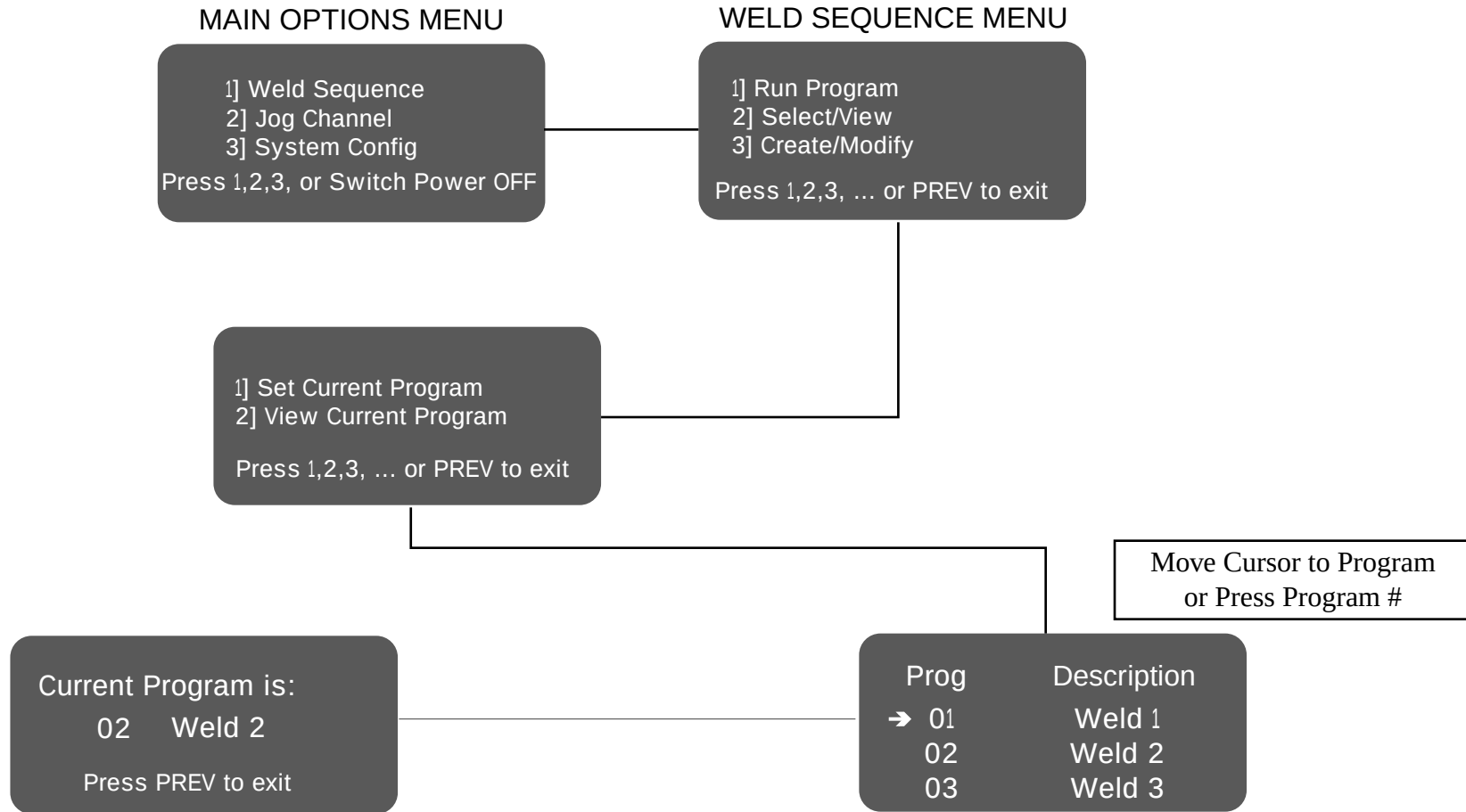
Move Cursor to the Left

◀

SynerWeld 210

SELECT/VIEW CURRENT PROGRAM

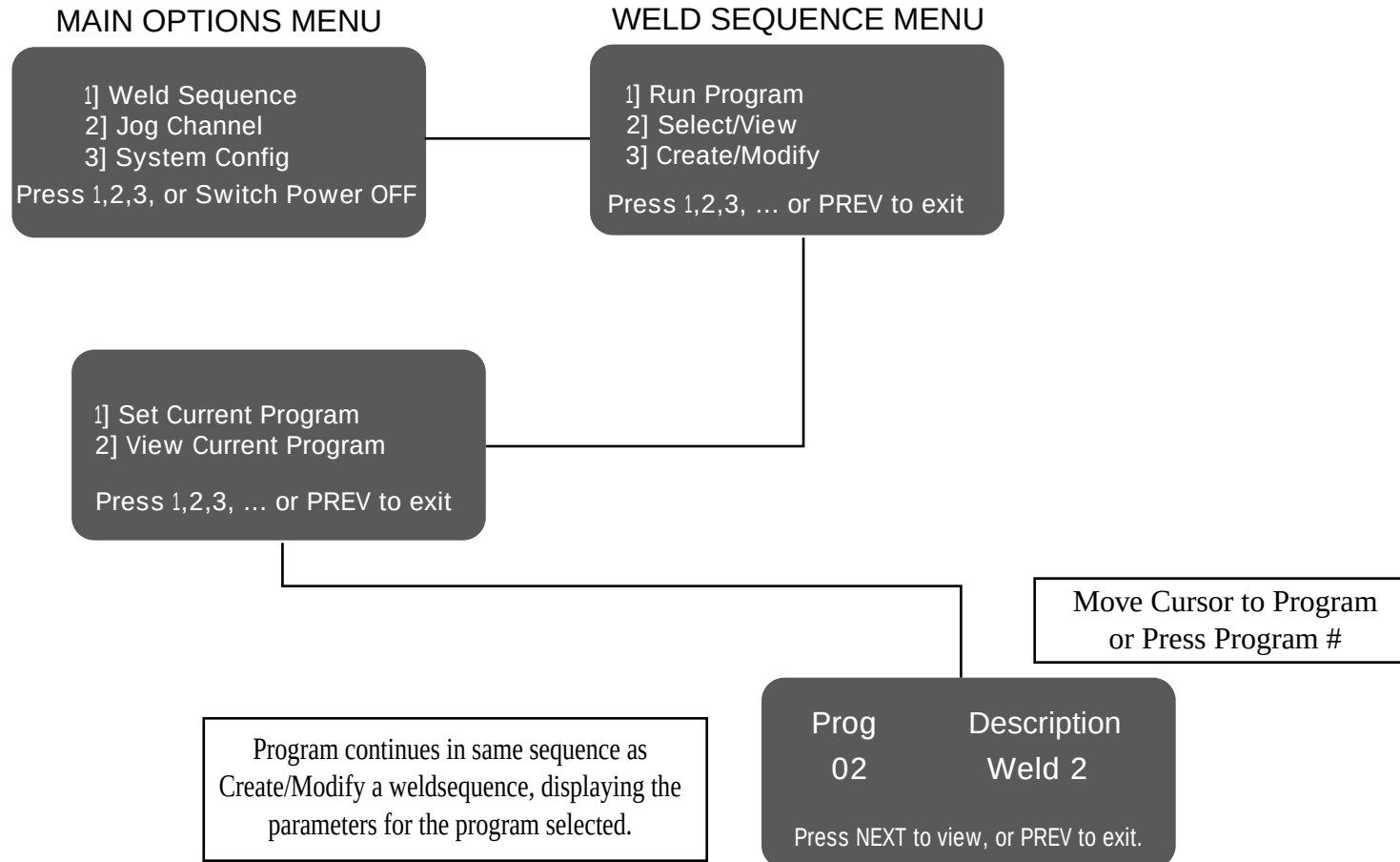
Set Current Program



SynerWeld 210

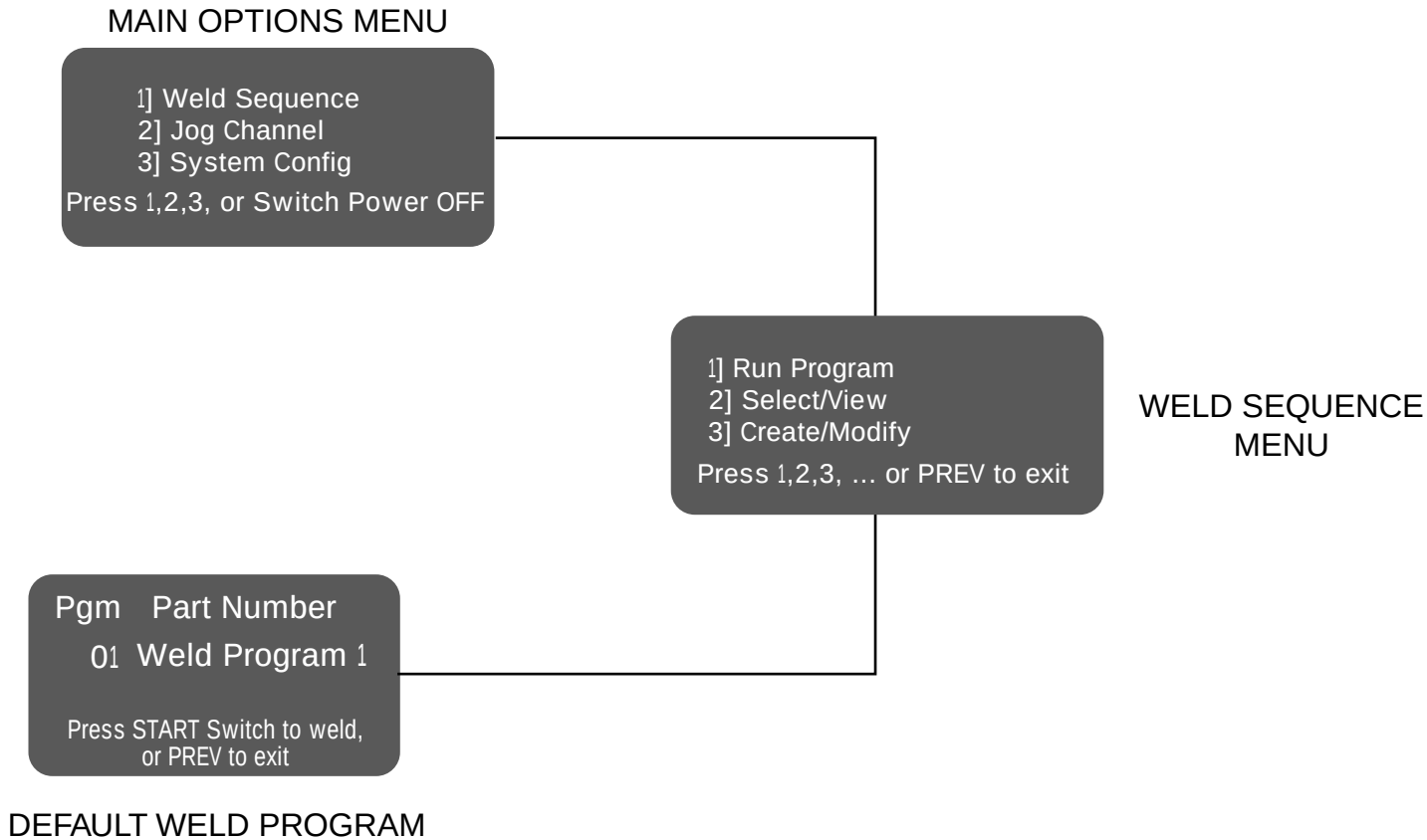
SELECT/VIEW CURRENT PROGRAM

View Current Program



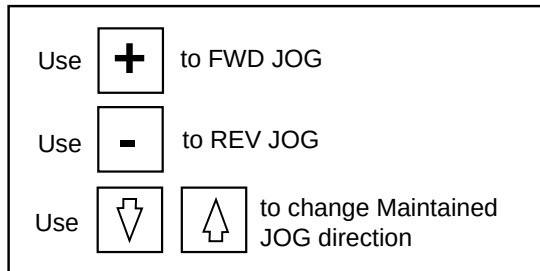
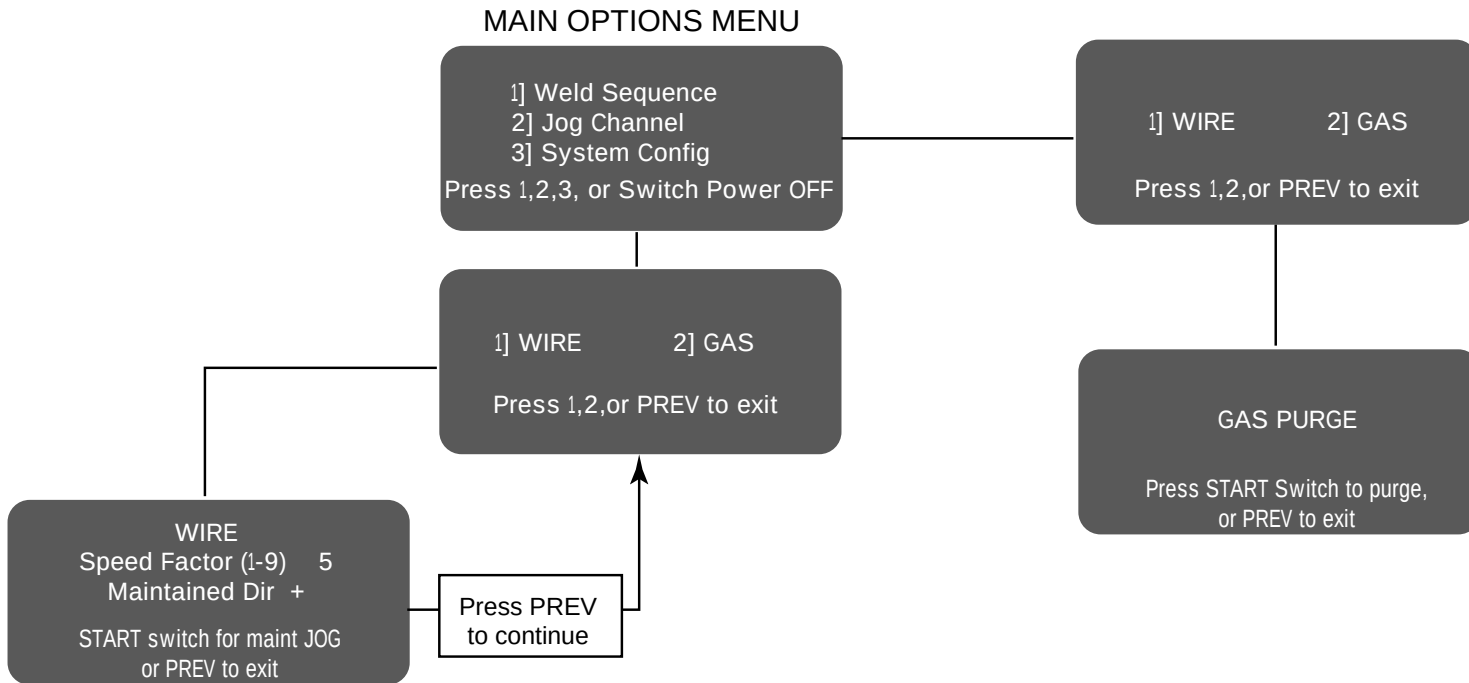
SynerWeld 210

RUN WELD PROGRAM



SynerWeld 210

JOG CHANNEL



SynerWeld 210

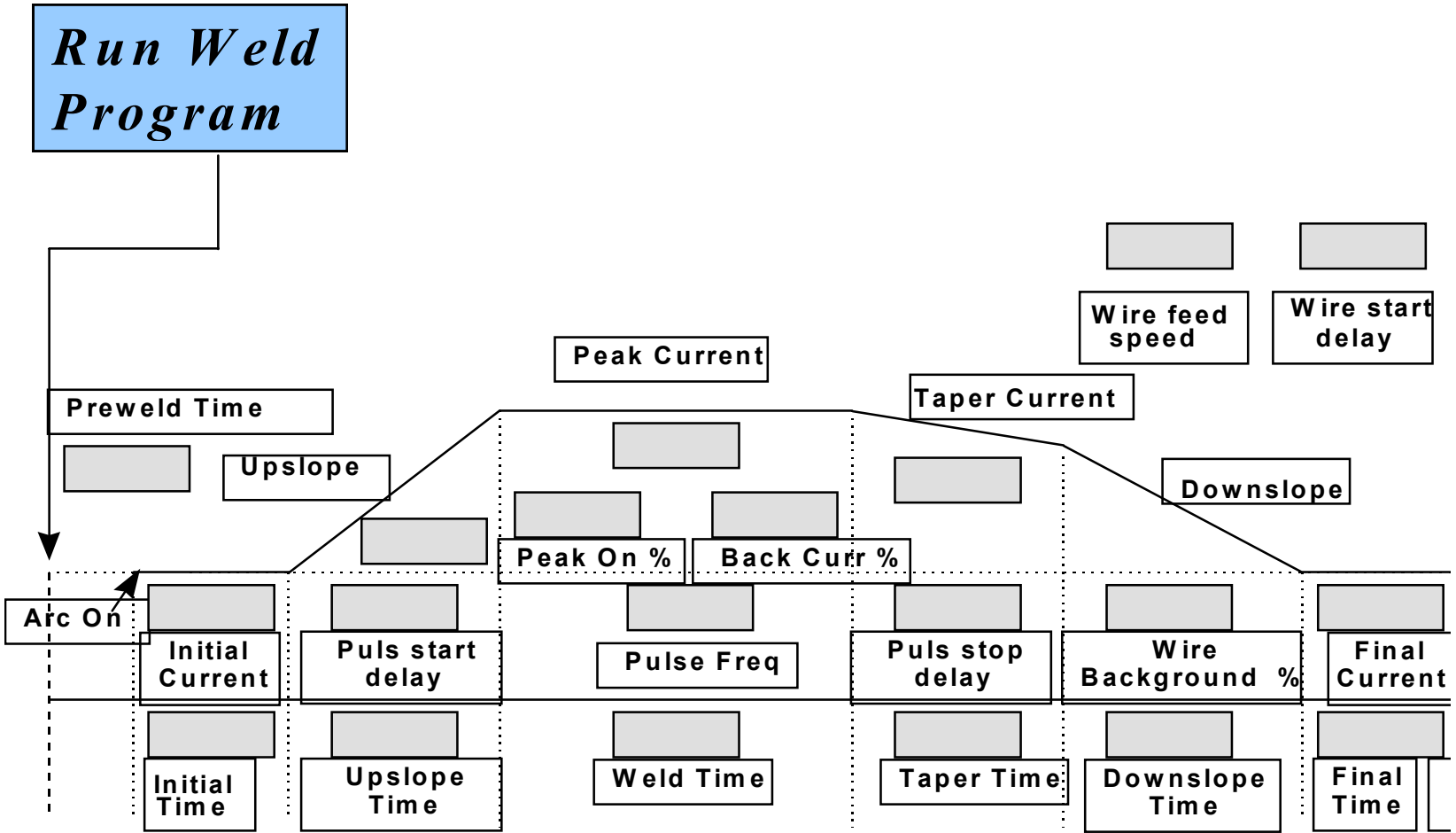
APPENDIX IX: CIRCUIT PROTECTION & WIRING

Input Voltage (Volts)	Power		Input Current		Freq. (Hz)	Recommended Sizes					
	1-Ph (kVA)	3-Ph (kVA)	1-Ph (Amps)	3-Ph (Amps)		Fuse (Amps)	Wire (AWG)	Wire (AWG)	Wire (AWG)	Wire (AWG)	(Canada)
200	8	6	39	21	50/60	45	25	10	14	8	10
208	8	6	37	20	50/60	40	25	10	14	8	10
230	8	6	34	19	50/60	35	20	10	12	8	12
380	8	6	24	12	50/60	25	15	14	18	10	12
415	8	6	22	12	50/60	25	15	14	18	10	12
460	8	6	20	11	50/60	25	15	14	18	10	12

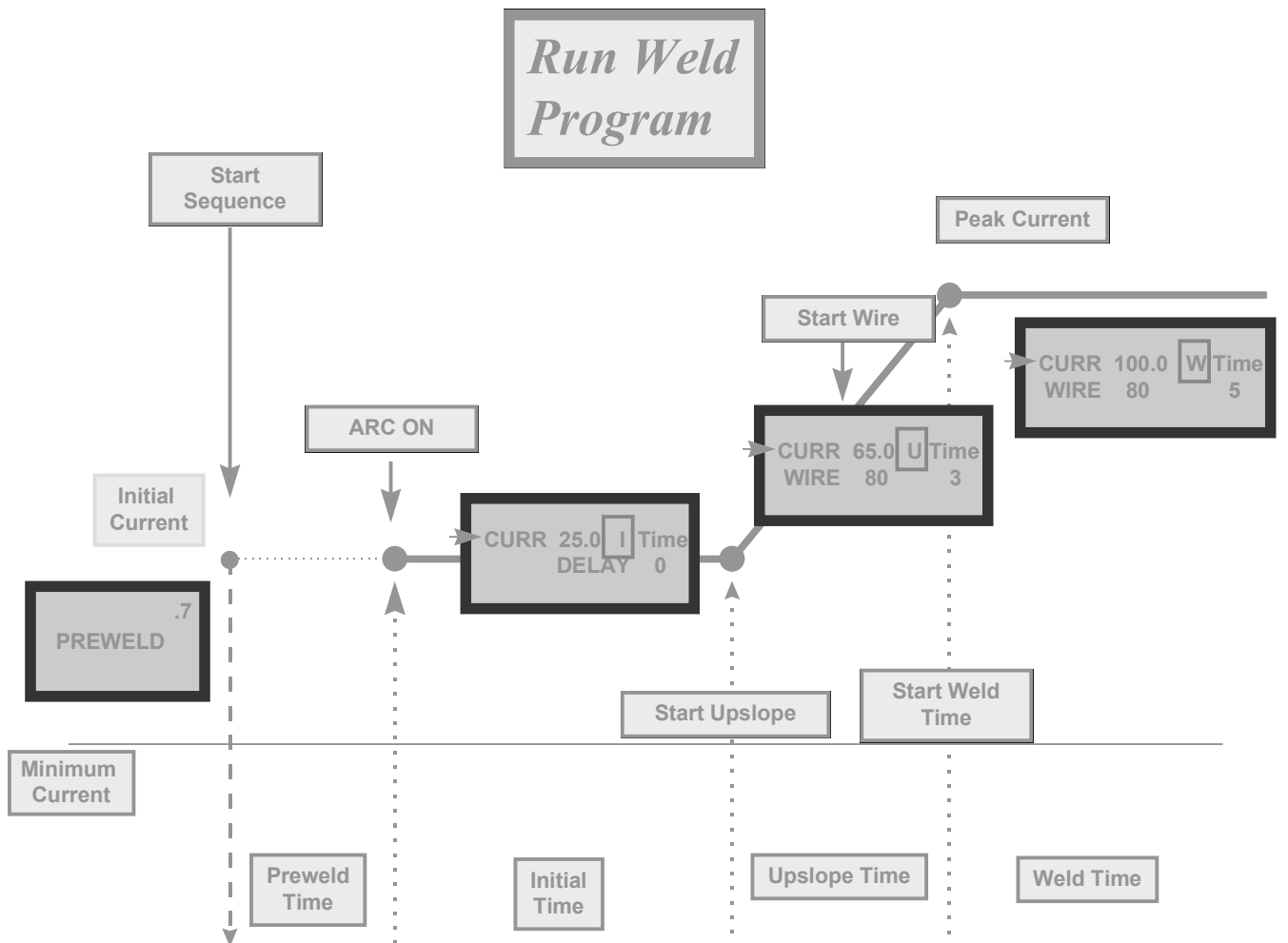
Recommended Circuit Protection and Wire Sizes

SynerWeld 2100

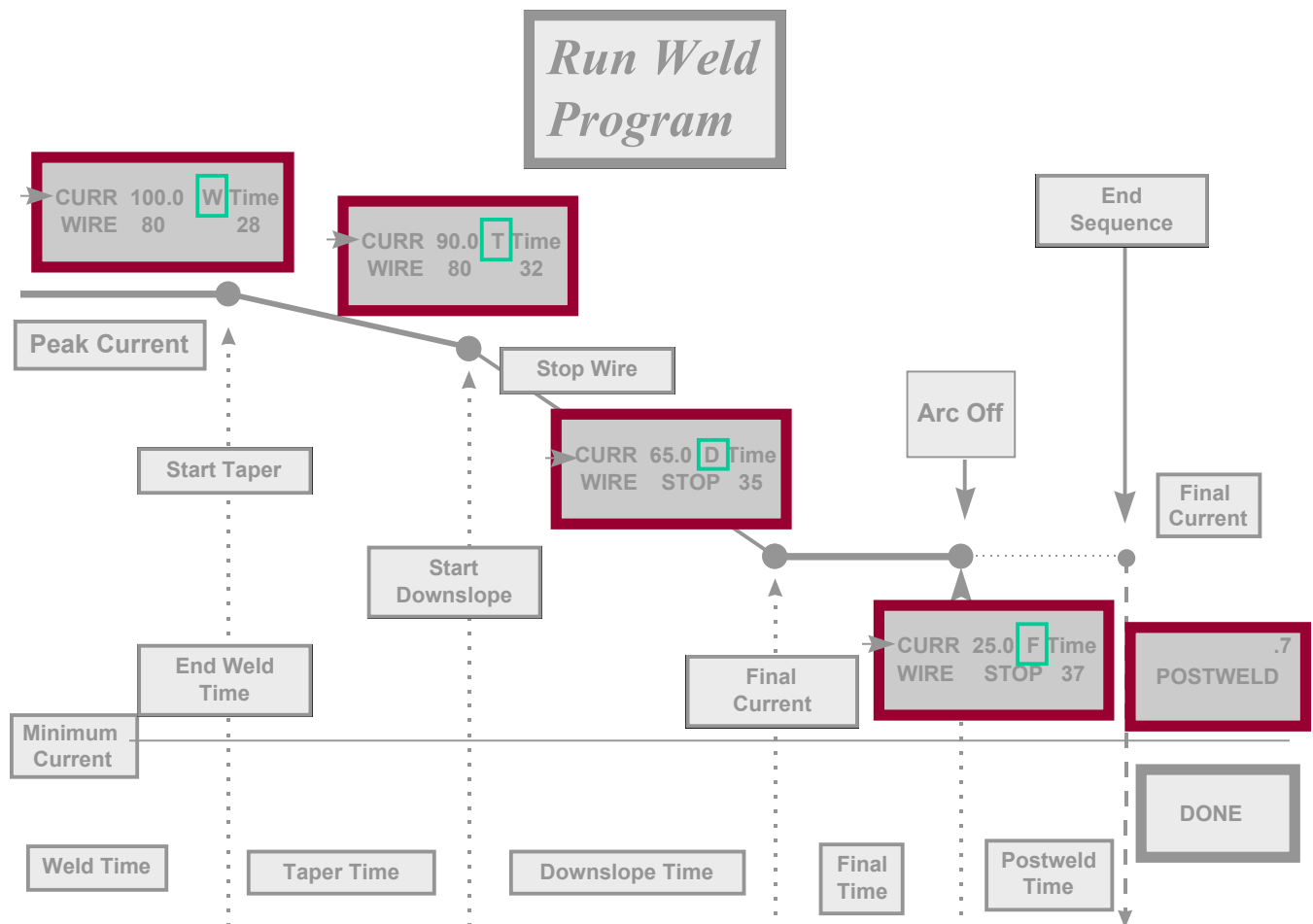
APPENDIX X: WELD SEQUENCE WORK SHEET



APPENDIX XI: RUN WELD SEQUENCE SCREEN DISPLAY



Upslope



Downslope

